Installation, Operation and Maintenance Manual	IOMM ACZ/AGZ-3
	Group: **Chiller**
	Part Number: **330411901**
	Effective: **October 2004**
	Supersedes: **IOMM ACZ/AGZ-2**

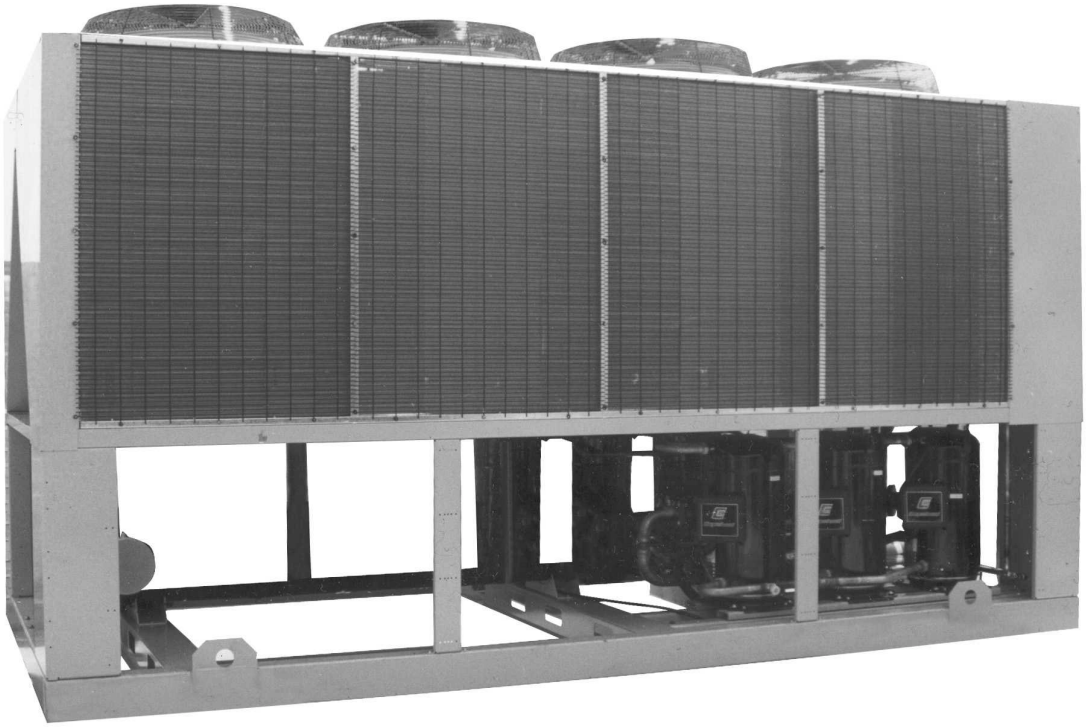
Air-Cooled Scroll Condensing Units

ACZ 030B through 155B

Air-Cooled Scroll Chillers w/ Remote Evaporators

AGZ 026BM through 130BM

60 Hertz, R-22



McQuay® Air Conditioning

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Introduction

General Description

This manual covers two similar product lines:

AGZ-BM, Packaged chiller with the evaporator shipped separately for remote installation, field piping to the outdoor unit, and interconnection of wiring. The refrigeration specialties are shipped from the factory for field installation.

ACZ-BC, Condensing unit with no evaporator included. For use with customer supplied low side (usually an air-handling unit), field piped and wired to the condensing unit.

These McQuay air-cooled units are complete, self-contained, automatic refrigerating units. Every unit is completely assembled, factory wired, tested and provided with a holding charge. Each unit consists of two air-cooled condenser sections with integral subcooler sections, two tandem or triple scroll compressors, (brazed-plate or replaceable tube, dual circuit shell-and-tube evaporator and liquid line components including manual, sight-glass/moisture indicators, solenoid valves, and thermal expansion valves on AGZ-BM only). Other features include compressor crankcase heaters, an evaporator heater for chilled water freeze protection (on AGZ-BM only), one-time pumpdown during "on" or "off" periods, and automatic compressor lead-lag to alternate the compressor starting sequence.

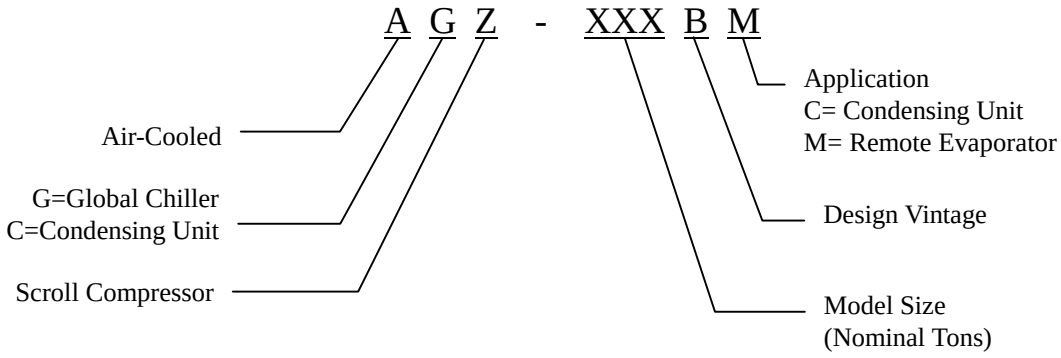
The electrical control center includes all equipment protection and operating controls necessary for dependable automatic operation. Condenser fan motors are protected in all three phases and started by their own three-pole contactors. Model ACZ condensing units require a field-supplied multi-step thermostat wired to the outdoor unit.

Inspection

Check all items carefully against the bill of lading. Inspect all units for damage upon arrival. Report shipping damage and file a claim with the carrier. Check the unit nameplate before unloading, making certain it agrees with the power supply available. McQuay is not responsible for physical damage after unit leaves the factory.

Note: Unit shipping and operating weights are available in the Physical Data tables beginning on page 26.

Nomenclature



Installation

Note: Installation is to be performed by qualified personnel who are familiar with local codes and regulations.

WARNING

Sharp edges on unit and coil surfaces are a potential hazard to personal safety. Avoid contact with them.

Handling

Be careful to avoid rough handling of the unit. Do not push or pull the unit from anything other than the base. Block the pushing vehicle away from the unit to prevent damage to the sheet metal cabinet and end frame (see Figure 1).

To lift the unit, 2 1/2" (64mm) diameter lifting tabs are provided on the base of the unit. Arrange spreader bars and cables to prevent damage to the condenser coils or cabinet (see Figure 2).

Figure 1, Suggested Pushing Arrangement

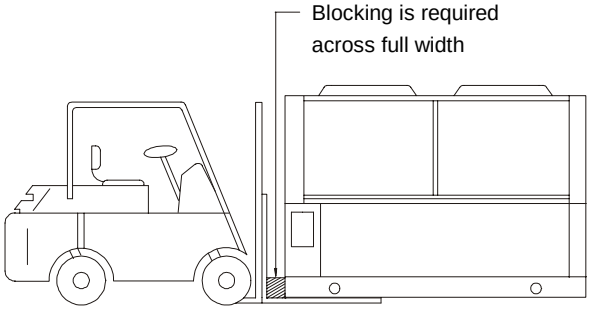
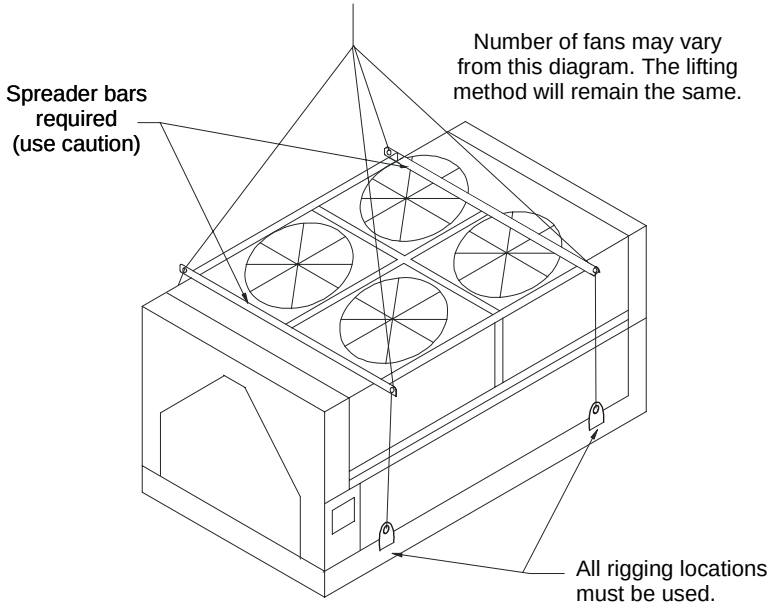


Figure 2, Suggested Lifting Arrangement



Location

Unit Placement

ACZ/AGZ units are for outdoor applications and can be mounted either on a roof or at ground level. For roof mounted applications, install the unit on a steel channel or I-beam frame to support the unit above the roof. For ground level applications, install the unit on a substantial base that will not settle. A one-piece concrete slab with footings extended below the frost line is recommended. Be sure the foundation is level within 1/2"(13mm) over its length and width. The foundation must be strong enough to support the weights listed in the Physical Data Tables beginning on page 26.

Figure 3, Clearances

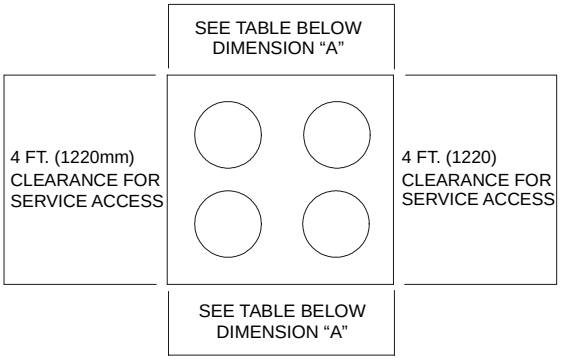

SEE TABLE BELOW DIMENSION "A"
4 FT. (1220mm) CLEARANCE FOR SERVICE ACCESS
4 FT. (1220) CLEARANCE FOR SERVICE ACCESS
SEE TABLE BELOW DIMENSION "A"

Table 1, Recommended Minimum Clearances

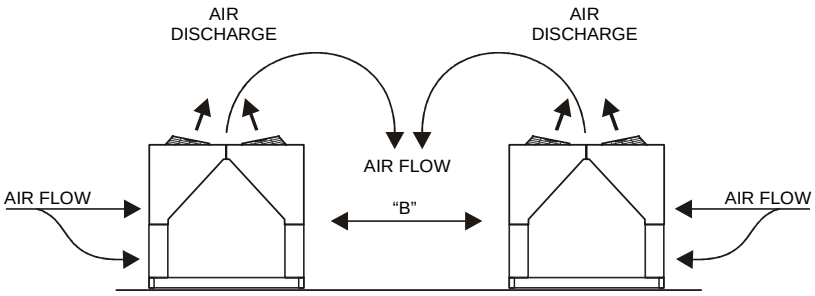
ACZ-BC Model Sizes	AGZ-BM Model Size	Coil Side "A" ft (m)	"B" ft (m)	"C" ft (m)	End Opposite Controls ft (m)	Control Panel End ft. (m)
030B – 080B	026B – 070B	4 (1.2)	8 (2.4)	6 (1.8)	4 (1.2)	4 (1.2)
090B – 155B	075B – 130B	6 (1.8)	12 (3.6)	8 (2.4)	4 (1.2)	4 (1.2)

Clearances

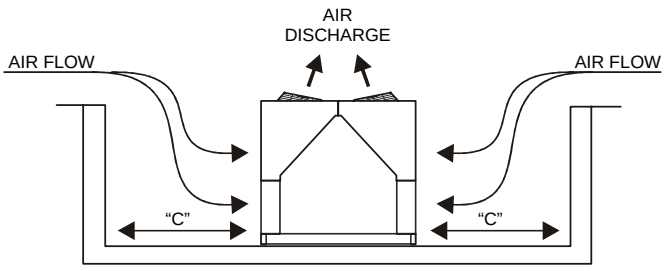
Do not block the flow of air to and from the condenser coil. Restricting airflow or allowing air recirculation will result in a decrease in unit performance and efficiency because discharge pressures are increased. There must be no obstruction above the unit that would deflect discharge air downward where it could be recirculated back to the inlet of the condenser coil. The condenser fans are propeller type and will not operate with ductwork.

Install the unit with enough side clearance for air entrance to the coil and for servicing. Provide service access to the evaporator, compressors, electrical control panel and piping components.

Do not allow debris to accumulate near the unit where it could be drawn into the condenser coil. Keep condenser coils and fan discharge free of snow or other obstructions to permit adequate airflow for proper operation.



The recommended minimum side clearance between two units is dimension "B' in table on this page.



The unit must not be installed in a pit or enclosure that is deeper or taller than the height of the unit unless extra space is provided. The minimum clearance on each side of the unit is dimension "C" in table on this page.

Restricted Air Flow

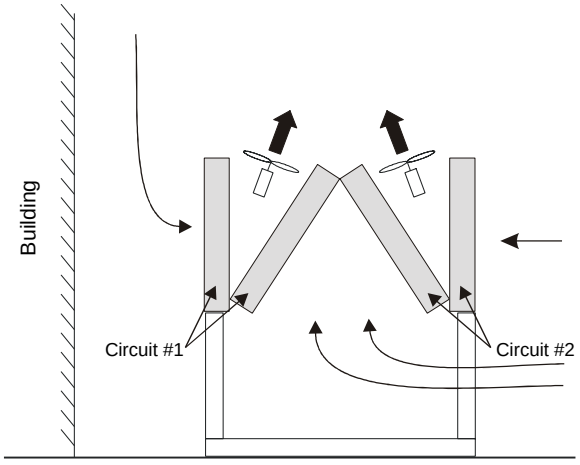
General

The clearances required for design-life operation of ACZ/AGZ air-cooled units are described in the previous section. Occasionally, these clearances cannot be maintained due to site restrictions, such as units being too close together, or a fence or wall restricting airflow, or both.

The McQuay ACZ/AGZ units have several features that can mitigate the problems attributable to restricted airflow.

- The condenser section is configured as shown below. This configuration allows inlet air for these coils to come in from either side. A vertical coil and its adjacent angled coil are manifolded together to serve one refrigerant circuit.
- The MicroTech II™ control is proactive in response to "off-design conditions". In the case of single or compounded influences restricting airflow to the unit, the microprocessor will act to keep the compressor(s) running (possibly at reduced capacity) rather than allowing a shut-off on high discharge pressure.
- The MicroTech II™ control can be programmed to sequence the compressors in the most advantageous way. For example, in the diagram shown below, it might be desirable to program circuit #1 to be the lag circuit (last circuit to reach full load) during periods of high ambient temperatures.

Figure 4, Coil and Fan Arrangement



NOTE: Models ACZ 030 to 045 and AGZ 026 to 035 do not have an interior slanted coil.

The following sections discuss the most common situations of condenser air restriction and give capacity and power adjustment factors for each. Note that in unusually severe conditions, the MicroTech II™ controller would adjust the unit operation to remain online until a less severe condition is reached.

Case 1, Building or Wall on One Side of One Unit

The existence of a screening wall, or the wall of a building, in close proximity to an air-cooled unit is common in both rooftop and ground level applications. Hot air recirculation on the coils adjoining the wall will increase compressor discharge pressure, decreasing capacity and increasing power consumption. Only the compressor(s) connected to these coils will be affected.

When close to a wall, place chillers on the north or east-side of them. Have prevailing winds blowing parallel to the unit's long axis. The worst case is to have wind blowing hot discharge air into the wall.

Figure 5, Unit Adjacent to Wall

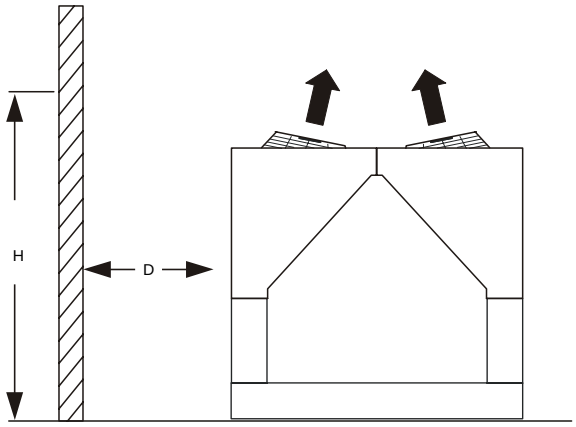
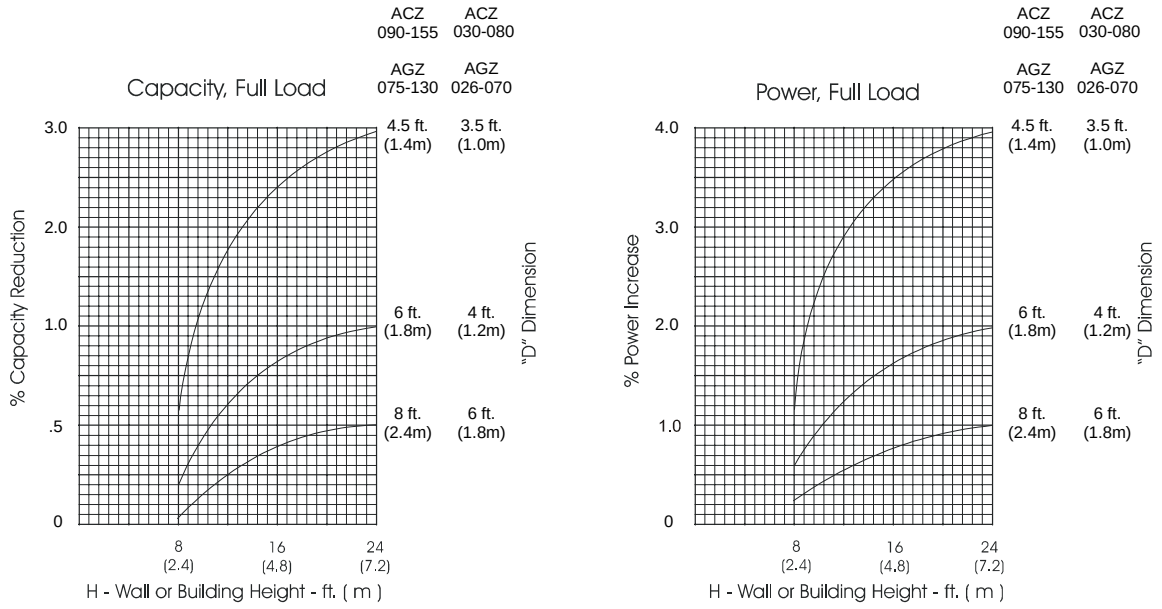


Figure 6, Adjustment Factors



Case 2, Two Units Side By Side

Two or more units sited side by side are common. If spaced closer than 12 feet (3.7 meters), or 8 feet (2.5meters), depending on size, it is necessary to adjust the performance of each unit. Circuits adjoining each other are affected. **NOTE:** This case applies only to *two* units side by side. See Case 3 for three or more parallel units. If one of the two units also has a wall adjoining it, see Case 1. Add the two adjustment factors together and apply to the unit located between the wall and the other unit.

Mounting units end to end will not necessitate adjusting performance. Depending on the actual arrangement, sufficient space must be left between the units for access to the control panel door opening and/or evaporator tube removal. See "Clearance" section of this guide for requirements for specific units.

Figure 7, Two Units Side by Side

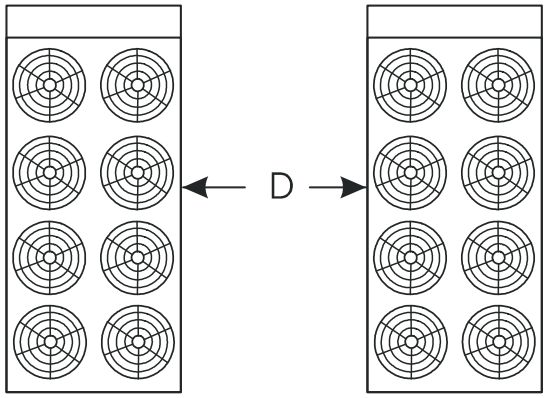
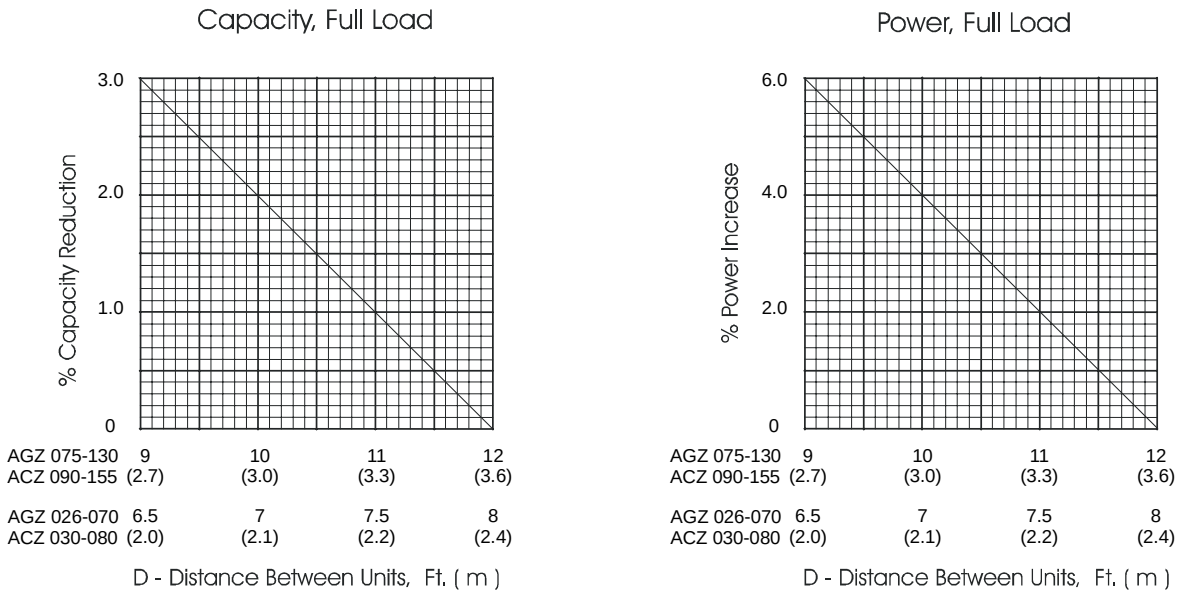


Figure 8, Adjustment Factor



Case 3, Three or More Units Side By Side

When three or more units are side by side, the outside units (1 and 3 in this case) are influenced by the middle unit only on their inside circuits. Their adjustment factors will be the same as Case 2. All inside units (only number 2 in this case) are influenced on both sides and must be adjusted by the factors shown below.

Figure 9, Three or More Units

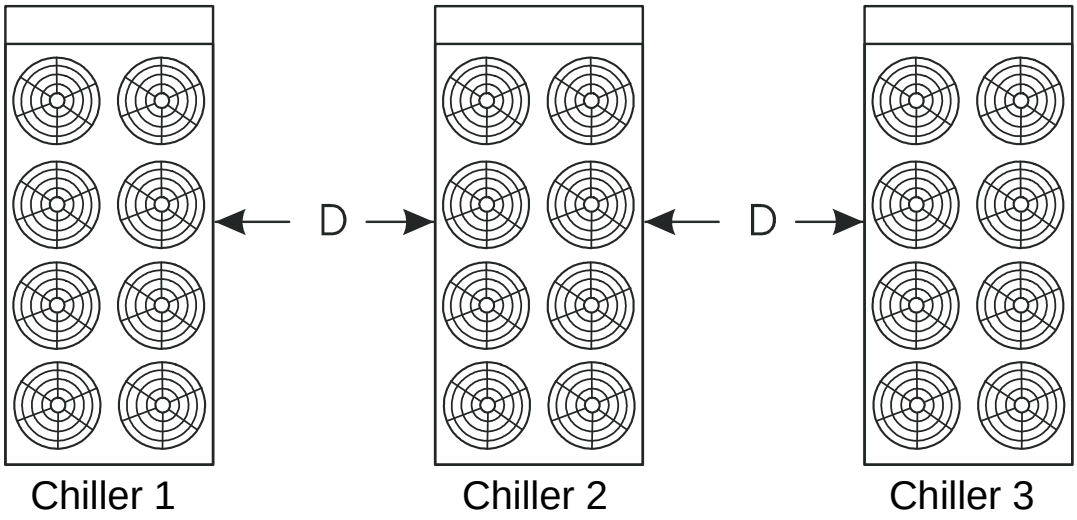
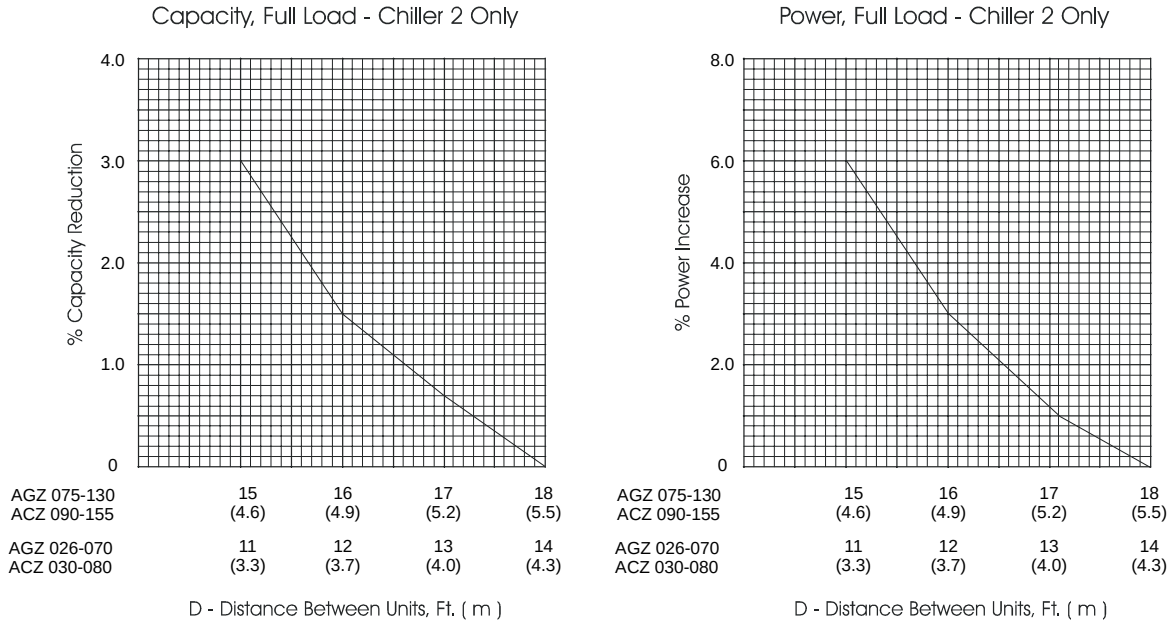


Figure 10, Adjustment Factor



Case 4, Open Screening Walls

Decorative screening walls are often used to help conceal a unit either on grade or on a rooftop. These walls should be designed such that the combination of their open area and distance from the unit do not require performance adjustment. It is assumed that the wall height is equal to or less than the unit height when mounted on its base support. This is usually satisfactory for concealment. If the wall height is greater than the unit height, see Case 5, Pit Installation.

The distance from the ends of the unit to the end walls must be sufficient for service, opening control panel doors, and pulling evaporator tubes, as applicable.

If each side wall is a different distance from the unit, the distances can be averaged, providing either wall is not less than 8 feet (2.4 meters) from the unit. For example, do not average 4 feet and 20 feet to equal 12 feet.

Figure 11, Open Screening Walls

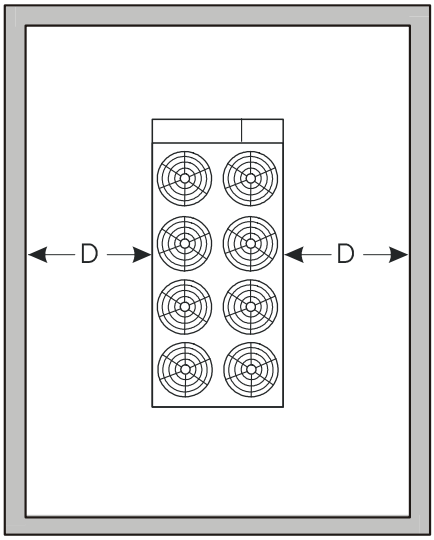
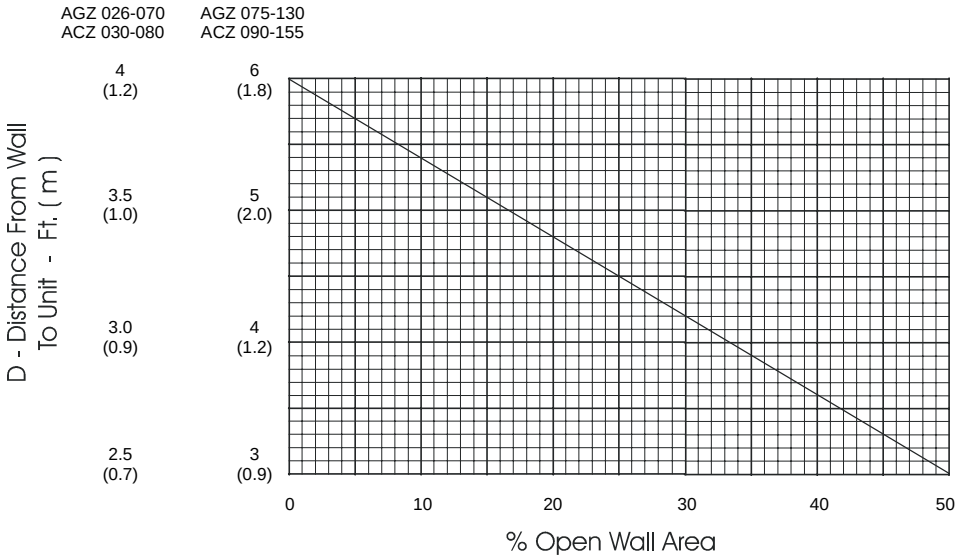


Figure 12, Wall Free Area vs. Distance



Case 5, Pit/Solid Wall Installation

Pit installations can cause operating problems and great care should be exercised if they are to be used on an installation. Recirculation and restriction can both occur. A solid wall surrounding a unit is substantially the same as a pit and the data presented here should be used.

Steel grating is sometimes used to cover a pit to prevent accidental falls or trips into the pit. The grating material and installation design must be strong enough to prevent such accidents, yet provide abundant open area or serious recirculation problems will occur. Have any pit installation reviewed by McQuay application engineers prior to installation for air-flow characteristics. The installation design engineer must approve the work to avoid an unreasonable risk of accident and is responsible for final design criteria.

Figure 13, Pit Installation

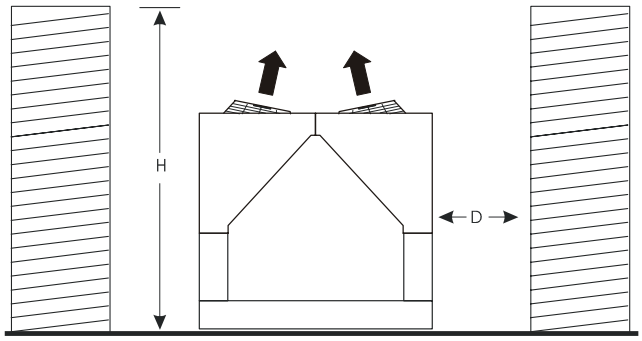
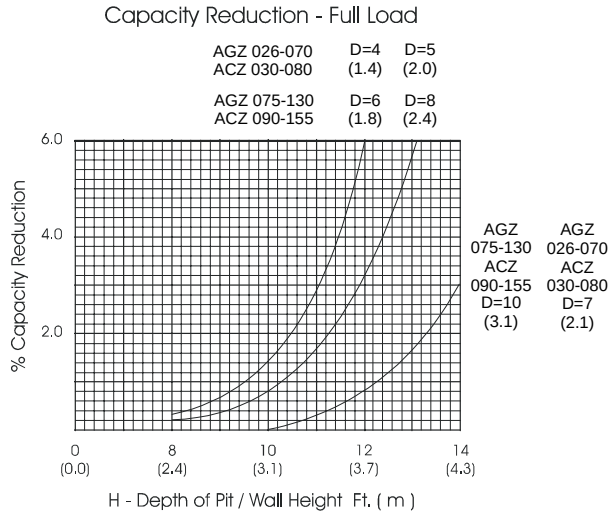
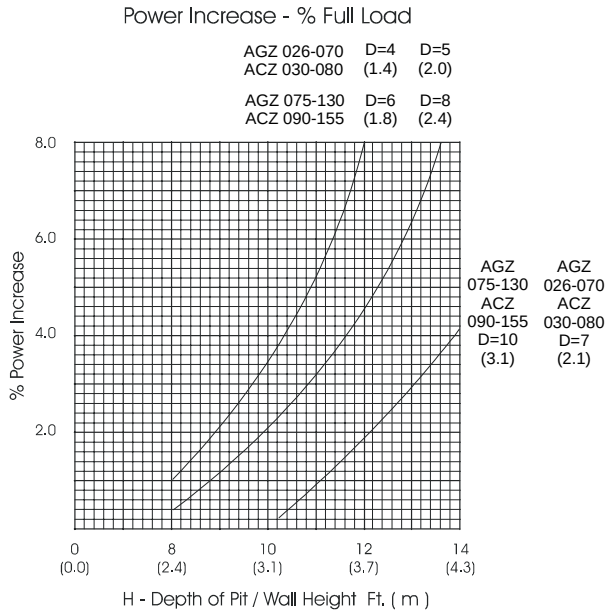


Figure 14, Adjustment Factor





Sound Isolation

The low sound level of the ACZ/AGZ units is suitable for most applications. When additional sound reduction is necessary, locate the unit away from sound sensitive areas. Avoid locations beneath windows, or between structures where normal operating sounds can be objectionable. Reduce structurally transmitted sound by isolating refrigerant lines, electrical conduit and the unit itself. Use wall sleeves and rubber isolated piping hangers to reduce transmission of water, refrigerant, or pump noise into occupied spaces. Use flexible electrical conduit to isolate sound transmission through electrical conduit. Spring isolators are effective in reducing the low amplitude sound generated by scroll compressors and for unit isolation in sound sensitive areas.

Vibration Isolators

Vibration isolator springs are recommended for all roof-mounted installations, or wherever vibration transmission is a consideration. Some form of isolator is also recommended for slab installations, primarily to keep the unit base from resting its entire length directly on the slab.

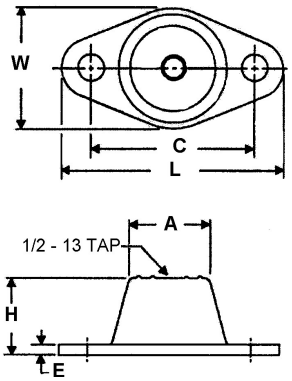
Table 2 and Table 3 list isolator point loads for all unit sizes. Figure 15 and 16 shows isolator locations. See Dimensional Data for detailed mounting hole location.

Isolator Installation

The unit should be initially installed on shims or blocks at the listed free height. When all piping, wiring, flushing, charging, etc., is completed, adjust the springs upward to load them and to provide clearance to remove the shims or blocks.

Installation of spring isolators requires flexible piping connections and at least three feet of conduit flex tie-ins. Piping and conduit must be supported independently of the unit.

Figure 15, Neoprene-in-Shear Isolators



Color Code	L	W	H	B	C	D
Gray	5.5	3.37	1.75	0.5	4.12	0.56
Black, Red	6.25	4.62	1.62	0.5	5.0	0.56

Spring Isolators

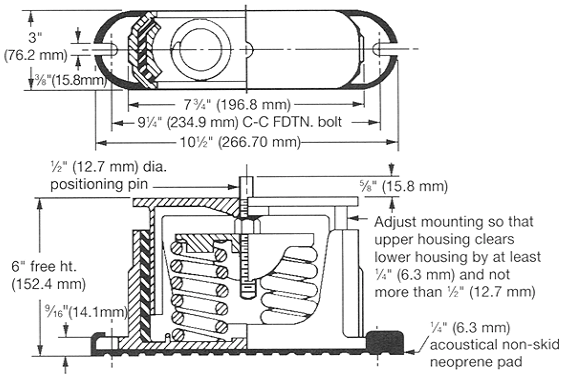


Figure 16, Isolator Locations,

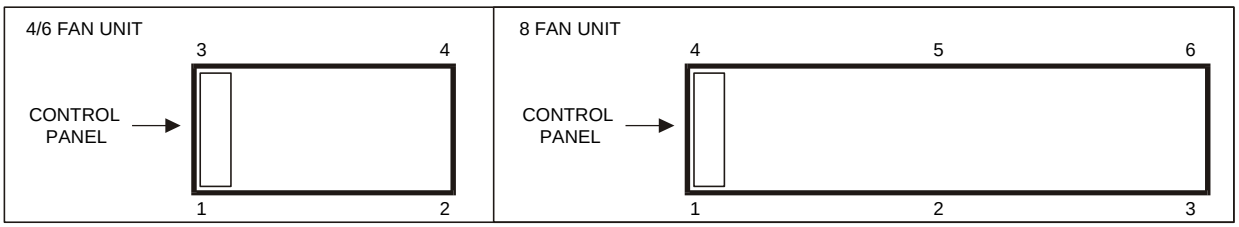


Table 2, Isolator Loads At Each Mounting Location (With Aluminum Fins)

ACZ-B Model	AGZ-BM Model		Shipping Wt	Operating. Wt	Loc. 1	Loc. 2	Loc. 3	Loc. 4	Total	(1) Add'l for Copper Fins
ACZ 030	AGZ 026	lbs	3550	3600	1227	901	849	623	3600	72
		kg	1608	1631	556	408	385	282	1631	32
ACZ 035	AGZ 030	lbs	3550	3600	1227	901	849	623	3600	72
		kg	1608	1631	556	408	385	282	1631	32
ACZ 040	AGZ 035	lbs	3550	3600	1227	901	849	623	3600	72
		kg	1608	1631	556	408	385	282	1631	32
ACZ 045	AGZ 040	lbs	3550	3610	1261	872	873	604	3610	72
		kg	1608	1635	571	395	395	274	1635	32
ACZ 050	AGZ 045	lbs	3590	3650	1275	881	883	611	3650	72
		kg	1626	1653	578	399	400	277	1653	32
ACZ 055	AGZ 050	lbs	3730	3800	1295	951	896	658	3800	119
		kg	1690	1721	587	431	406	298	1721	54
ACZ 060	AGZ 055	lbs	3780	3850	1303	1016	860	671	3850	119
		kg	1712	1744	590	460	390	304	1744	54
ACZ 065	AGZ 060	lbs	3820	4040	1367	1066	903	704	4040	142
		kg	1730	1830	619	483	409	319	1830	65
ACZ 070	AGZ 065	lbs	3970	4070	1305	1146	862	757	4070	142
		kg	1798	1844	591	519	390	343	1844	65
ACZ 080	AGZ 070	lbs	4080	4180	1278	1192	885	825	4180	217
		kg	1848	1894	579	540	401	374	1894	99

NOTE (1): Additional weight for copper coils is per mounting location.

Table 3, Isolator Loads At Each Mounting Location (With Aluminum Fins)

ACZ Model	AGZ-BM Model		Shipping Wt.	Operating Wt.	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	TOTAL	(1) Add'l for Copper Fins
ACZ090	AGZ 075	lbs	5510	5630	1649	1166	1649	1166	-	-	5630	217
		kg	2496	2550	747	528	747	528	-	-	2550	99
ACZ100	AGZ 085	lbs	5670	5790	1734	1227	1657	1172	-	-	5790	217
		kg	2569	2623	786	556	751	531	-	-	2623	99
ACZ110	AGZ 090	lbs	5830	5950	1770	1205	1770	1205	-	-	5950	217
		kg	2641	2695	802	546	802	546	-	-	2695	99
ACZ120	AGZ 100	lbs	6820	6970	1323	1188	1053	1265	1135	1006	6970	289
		kg	3089	3157	599	538	477	573	514	456	3157	131
ACZ130	AGZ 110	lbs	7080	7230	1396	1205	1014	1396	1205	1014	7230	289
		kg	3207	3275	632	546	459	632	546	459	3275	131
ACZ140	AGZ 120	lbs	7360	7480	1477	1275	1073	1411	1218	1026	7480	289
		kg	3334	3388	669	578	486	639	552	465	3388	131
ACZ155	AGZ 130	lbs	7640	7760	1555	1293	1032	1555	1293	1032	7760	289
		kg	3461	3515	704	586	467	704	586	467	3515	131

NOTE (1): Additional weight for copper coils is per mounting location.

Table 4, Isolator Kit Numbers

ACZ-B Model	030 - 040	045 - 065	070	080	090 - 110	120, 130	140, 155
AGZ-BM Model	026 - 035	040 - 060	065	070	075 - 090	100, 110	120, 130
Spring Kit Part No.	330349601	330349602	330349603	330349604	330349608	330349610	330349611
R-I-S Kit Part No.	330349701	330349701	330349703	330349703	330349706	330349707	330349708

Table 5, Isolator Locations

ACZ-BS, AGZ-BM Less Evaporator Units															
ACZ-BS Model	AGZ-BM Model	Operating Weight		Neoprene-In-Shear Mountings						Spring-Flex Mountings					
		lbs	kg	1	2	3	4	5	6	1	2	3	4 (1)	5	6
030	**026**	3600	1631	Black	Gray	Gray	Green	-	-	Orange	Purple	Red	Orange		
035	**030**	3600	1631	Black	Gray	Gray	Green	-	-	Orange	Purple	Red	Orange	-	-
040	**035**	3600	1631	Black	Gray	Gray	Green	-	-	Orange	Purple	Red	Orange	-	-
045	**040**	3610	1635	Black	Gray	Gray	Green	-	-	Orange	Purple	Purple	Orange	-	-
050	**045**	3650	1653	Black	Gray	Gray	Green	-	-	Orange	Purple	Purple	Orange	-	-
055	**050**	3800	1721	Black	Gray	Gray	Green	-	-	Orange	Purple	Purple	Orange	-	-
060	**055**	3850	1744	Black	Gray	Gray	Green	-	-	Orange	Purple	Purple	Orange	-	-
065	**060**	4040	1830	Black	Gray	Gray	Green	-	-	Orange	Purple	Purple	Orange	-	-
070	**065**	4070	1844	Black	Black	Gray	Gray	-	-	Orange	Purple	Purple	Red	-	-
080	**070**	4180	1894	Black	Black	Gray	Gray	-	-	Orange	Orange	Purple	Red	-	-
090	**075**	5630	2550	Red	Black	Red	Black	-	-	Green	Orange	Green	Orange	-	-
100	**085**	5790	2623	Red	Black	Red	Black	-	-	Green	Orange	Green	Orange	-	-
110	**090**	5950	2695	Red	Black	Red	Black	-	-	Green	Orange	Green	Orange	-	-
120	**100**	6970	3157	Black	Black	Black	Black	Black	Black	Orange	Orange	Purple	Orange	Orange	Purple
130	**110**	7230	3275	Black	Black	Black	Black	Black	Black	Orange	Orange	Purple	Orange	Orange	Purple
140	**120**	7480	3388	Red	Black	Black	Red	Black	Black	Green	Orange	Purple	Green	Orange	Purple
155	**130**	7760	3515	Red	Black	Black	Red	Black	Black	Green	Orange	Purple	Green	Orange	Purple

NOTE (1): Position #4 is a CP-1, single spring isolator for ACZ 030 to 065 and AGZ 026 to 060. All others are CP-2, two spring.

Ambient Temperature and Water Flow Limitations

ACZ/AGZ units are designed to operate in ambient temperatures as shown in the following table.

Table 6, Unit Maximum Operating Ambient Temperature

Unit Model	Standard Controls	w/ Low Ambient VFD Control Option	w/ Low Ambient VFD Control Plus High Ambient Panel Option
AGZ 026B – 130B ACZ 030B – 155B	115°F	105°F	125°F

The VFD Low Ambient Control Option imposes an additional heat load on the control panel limiting operation to 105°F ambient temperature. The addition of the High Ambient Panel Option allows operation to 125°F ambient temperature.

Compressor loading and unloading is adaptively determined by system load, ambient air temperature, and other inputs to the MicroTech control algorithms. An optional low ambient fan VFD option allows operation down to 0°F (-18°C). The minimum ambient temperature is based on still conditions where the wind is not greater than five mph. Greater wind velocities will result in reduced discharge pressure, increasing the minimum operating ambient temperature. Field-installed hail/wind guards are available to allow the chiller to operate effectively down to the ambient temperature for which it was designed.

Evaporator flow rates can be found on page 23. Operation below the minimum values can result in laminar flow causing freeze-up problems, scaling and poor control. Flow rates above the maximum values will result in unacceptable pressure drops and can cause excessive erosion, potentially leading to failure.

Water Piping (Model AGZ-BM)

Local authorities can supply the installer with the proper building and safety codes required for safe and proper installation.

Install piping with minimum bends and changes in elevation to minimize pressure drop. The following issues must be considered when designing and installing water piping:

1. Vibration eliminators to reduce vibration and noise transmission to the building.
2. Shutoff valves are required to isolate the unit from the piping system during unit servicing.
3. Manual or automatic air vent valves at the high points of the system. Drains must be installed at the lowest points in the system.
4. Adequate system water pressure must be maintained (expansion tank or regulating valve).
5. Temperature and pressure indicators located at the unit are required to aid in unit servicing.
6. A strainer or other means of removing foreign matter from the water before it enters the pump must be installed. Place the strainer far enough upstream to prevent cavitation at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and keep system performance up.
7. A strainer must be installed in the water line before the inlet of the evaporator. This will help prevent foreign material from entering and decreasing the evaporator performance.
8. If the unit is used as a replacement chiller, flush the system thoroughly before unit installation. Regular water analysis and chemical water treatment for the evaporator loop is recommended immediately at equipment start-up.
9. The total water volume in the system should be sufficient to prevent frequent "on-off" cycling. Turnover rate should not be less than 4 minutes for normal variable cooling loads.
10. When glycol is added to the water system for freeze protection, the refrigerant suction pressure will be lower, cooling performance less, and water side pressure drop greater. If the percentage of glycol is high, or if propylene is used instead of ethylene glycol, the added pressure drop and loss of performance could be substantial. When Glycol or Ice are selected as Unit Mode, the MicroTech controller will automatically reset the available range for the Leaving Water Temperature, Freezestat and Evaporator Pressure settings.

    Reset the freezestat setting to approximately 4 to 5 degrees F (2.3 to 2.8 degrees C) below the leaving chilled water setpoint temperature. See the section titled "Glycol Solutions" for additional information concerning glycol.
11. Perform a preliminary leak check before insulating the piping and filling the system.
12. Piping insulation should include a vapor barrier to prevent condensation and possible damage to the building structure from water dripping.

Figure 17, AGZ 075BM – AGZ 130BM, Typical Field Evaporator Water Piping

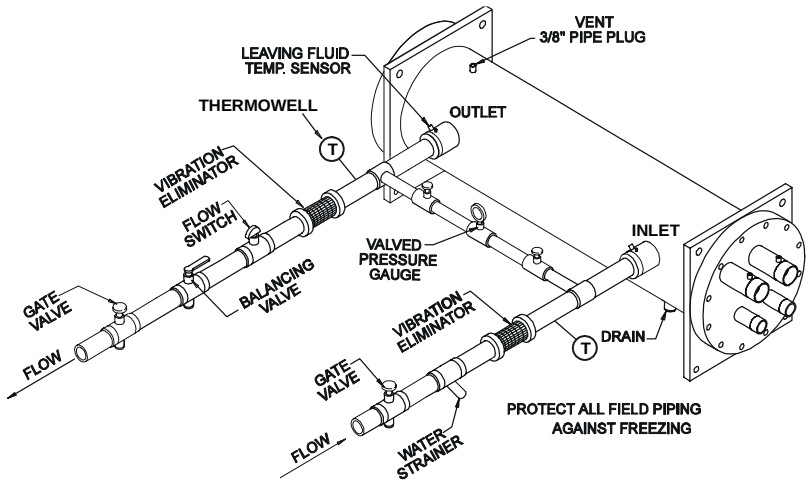
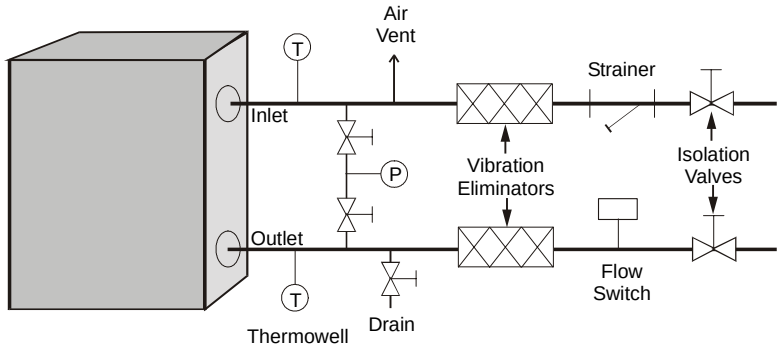


Figure 18, AGZ 026BM - AGZ 070BM, Typical Field Evaporator Water Piping



Flow Switch (Model AGZ-BM)

Mount a water flow switch in the leaving water line of the remote water chiller to shut down the unit when water flow is interrupted. A flow switch is an equipment protection control and should never be used to cycle a unit.

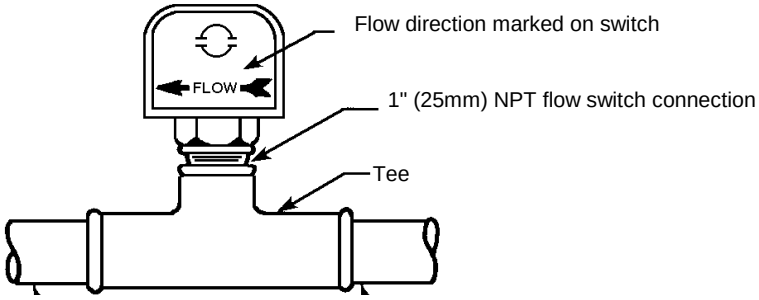
A flow switch is available from McQuay (part number 017503300). It is a "paddle" type switch and adaptable to any pipe size from 2" (51 mm) to 6" (152 mm) nominal. Certain minimum flow rates are required to close the switch and are listed in Table 7. Installation should be as shown in Figure 19. Connect the normally open contacts of the flow switch in the unit control center at terminals 44 and 61. There is also a set of normally closed contacts on the switch that can be used for an indicator light or an alarm to indicate when a "no flow" condition exists. Freeze protect any flow switch that is installed outdoors. Manufacturer's instructions included with the switch should be followed. **NOTE:** Differential pressure switches are not recommended for outdoor installation.

Table 7, Flow Switch Minimum/Maximum Flow Rates

Nominal Pipe Size Inches (mm)	Minimum Required Flow To Activate Switch - gpm (l/m)	Maximum Flow Rate gpm (l/m)
2 (50.8)	13.7 (51.8)	105 (397.4)
2 1/2 (63.50	17.9 (67.8)	149 (564.0)
3 (76.20	24.2 (91.6)	230 (870.6)
4 (101.6)	35.3 (134.0)	397 (1502.7)
5 (127.0)	48.6 (184.0)	654 (2475.4)
6 (152.4)	60.3 (228.0)	900 (3406.5)

Note: See pressure drop table on page 23 for minimum and maximum flow through the evaporator.

Figure 19, Flow Switch Installation



Water Connections

Bring water piping to the evaporator through the side between the vertical supports. Provide taps for the connection of pressure gauges and thermometers in the inlet and outlet lines. Check the inlet and outlet labels on the unit against the certified drawings supplied on the job and be sure the water piping is hooked up correctly. Contact the McQuay sales office if any discrepancies exist.

Variable Speed Pumping

Variable water flow involves lowering the water flow through the evaporator as the load decreases. McQuay chillers are designed for this duty provided that the rate of change in water flow is slow and the minimum and maximum flow rates for the vessel are not exceeded.

The recommended maximum change in water flow is 10 percent of the change per minute.

The water flow through the vessel must remain between the minimum and maximum values listed on page 23. If flow drops below the minimum allowable, large reductions in heat transfer can occur. If the flow exceeds the maximum rate, excessive pressure drop and tube erosion can occur.

System Water Volume Considerations

All chillers need adequate time to recognize a load change, respond to the change and stabilize without short cycling the compressor. The water volume in the system and the size of the piping loop is a critical consideration. Good engineering practice is to have a minimum water volume of four times the flow rate (GPM) for comfort cooling applications. For process applications where the load can change quickly, contact the local McQuay sales office for recommendations. A water storage tank (provided by others) can be required to increase the system water volume in some systems.

Since there are many other factors that can influence performance, systems can successfully operate below these suggestions. However, as the water volume decreases below these suggestions, the possibility of problems increases. We believe that these guidelines should be an industry standard and not just recommendations from McQuay.

Glycol Solutions

The use of a glycol/water mixture in the evaporator to prevent freezing will reduce system capacity and efficiency and increase pressure drop. The system capacity, required glycol solution flow rate, and pressure drop with glycol can be calculated using the following formulas and tables.

1. **Capacity** – Multiply the capacity based on water by the *Capacity* correction factor from Table 8 through Table 11.
2. **Flow** – Multiply the water evaporator flow by the *Flow* correction factor from Table 8 through Table 11 to determine the increased evaporator flow due to glycol.

   If the flow is unknown, it can be calculated from the following equation:

$$\text{Glycol Flow (gpm)} = \frac{24 \times \textit{Tons Capacity (glycol)}}{\textit{Delta} - T} \times \textit{Flow Correction Factor}$$

3. **Pressure drop** -- Multiply the water pressure drop from page 23 by *Pressure Drop* correction factor from Table 8 through Table 11. High concentrations of propylene glycol at low temperatures can cause unacceptably high-pressure drops.
4. **Power** -- Multiply the water system power by *Power* correction factor from Table 8 through Table 11.

Test coolant with a clean, accurate glycol solution hydrometer (similar to that found in service stations) to determine the freezing point. Obtain percent glycol from the freezing point table below. It is recommended that a minimum of 25% solution by weight be used for protection against corrosion or that additional compatible inhibitors be added.

CAUTION

Do not use an automotive grade antifreeze. Industrial grade glycols must be used. Automotive antifreeze contains inhibitors which will cause plating on the copper tubes within the chiller evaporator. The type and handling of glycol used must be consistent with local codes.

Table 8, Ethylene Glycol Factors for Models AGZ 026BM to 070BM

% E.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.998	0.998	1.036	1.097
20	18	-7.8	0.993	0.997	1.060	1.226
30	7	-13.9	0.987	0.995	1.092	1.369
40	-7	-21.7	0.980	0.992	1.132	1.557
50	-28	-33.3	0.973	0.991	1.182	1.791

Table 9, Propylene Glycol Factors for Models AGZ 026BM to 070BM

% P.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.995	0.997	1.016	1.100
20	19	-7.2	0.987	0.995	1.032	1.211
30	9	-12.8	0.978	0.992	1.057	1.380
40	-5	-20.6	0.964	0.987	1.092	1.703
50	-27	-32.8	0.952	0.983	1.140	2.251

Table 10, Ethylene Glycol Factors for Models AGZ 075BM to 130BM

% E.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.994	0.998	1.038	1.101
20	18	-7.8	0.982	0.995	1.063	1.224
30	7	-13.9	0.970	0.992	1.095	1.358
40	-7	-21.7	0.955	0.987	1.134	1.536
50	-28	-33.3	0.939	0.983	1.184	1.755

Table 11, Propylene Glycol Factors for Models AGZ 075BM to 130BM

% P.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.988	0.996	1.019	1.097
20	19	-7.2	0.972	0.992	1.035	1.201
30	9	-12.8	0.951	0.987	1.059	1.351
40	-5	-20.6	0.926	0.979	1.095	1.598
50	-27	-32.8	0.906	0.974	1.142	2.039

Altitude Correction Factors

Performance tables are based at sea level. Elevations other than sea level affect the performance of the unit. The decreased air density will reduce condenser capacity, consequently reducing the unit's performance. For performance at elevations other than sea level refer to Table 12 or Table 13.

Evaporator Temperature Drop Factors

Performance tables are based on a 10 degree F (5 degree C) temperature drop through the evaporator. Adjustment factors for applications with temperature ranges from 6 degree F to 16 degree F (3.3 degree C to 8.9 degree C) are found in Table 12 and Table 13. Ranges outside these temperatures can affect the control system's capability to maintain acceptable control and must not be used.

The maximum water temperature that can be circulated through the evaporator in a non-operating mode is 100°F (37.8°C).

Fouling Factor

Performance tables are based on water with a fouling factor of:

$0.0001\,ft^2 \times hr \times °F / BTU$ *or* $(0.0176 m^2 \times °C / kW)$ per ARI 550/590-98.

As fouling is increased, performance decreases. For performance at other than 0.0001 (0.0176) fouling factor, refer to Table 12 and Table 13. Foreign matter in the chilled water system will adversely affect the heat transfer capability of the evaporator and could increase the pressure drop and reduce the water flow. Maintain proper water treatment to provide optimum unit operation.

Table 12, Capacity and Power Derates, Models AGZ 026 to 070

Altitude	Chilled Water Delta T		Fouling Factor							
			0.0001 (0.0176)		0.00025 (0.044)		0.00075 (0.132)		0.00175 (0.308)	
	°F	°C	Cap.	Power	Cap.	Power	Cap.	Power	Cap.	Power
Sea Level	6	3.3	0.978	0.993	0.975	0.991	0.963	0.987	0.940	0.980
	8	4.4	0.989	0.996	0.986	0.994	0.973	0.990	0.950	0.983
	10	5.6	1.000	1.000	0.996	0.999	0.984	0.994	0.961	0.987
	12	6.7	1.009	1.003	1.005	1.001	0.993	0.997	0.969	0.990
	14	7.7	1.018	1.004	1.014	1.003	1.002	0.999	0.978	0.991
	16	8.9	1.025	1.007	1.021	1.006	1.009	1.001	0.985	0.994
2000 feet	6	3.3	0.977	1.001	0.973	1.000	0.961	0.996	0.938	0.989
	8	4.4	0.987	1.006	0.984	1.004	0.971	1.000	0.948	0.993
	10	5.6	0.998	1.009	0.995	1.007	0.982	1.003	0.959	0.996
	12	6.7	1.007	1.011	1.004	1.010	0.991	1.006	0.967	0.998
	14	7.7	1.014	1.014	1.011	1.013	0.998	1.009	0.974	1.001
	16	8.9	1.022	1.016	1.018	1.014	1.005	1.010	0.981	1.003
4000 feet	6	3.3	0.973	1.011	0.970	1.010	0.957	1.006	0.935	0.998
	8	4.4	0.984	1.014	0.980	1.013	0.968	1.009	0.945	1.001
	10	5.6	0.995	1.019	0.991	1.017	0.979	1.013	0.955	1.005
	12	6.7	1.004	1.021	1.000	1.020	0.987	1.016	0.964	1.008
	14	7.7	1.011	1.024	1.007	1.023	0.994	1.018	0.971	1.011
	16	8.9	1.018	1.027	1.014	1.026	1.002	1.021	0.978	1.014
6000 feet	6	3.3	0.969	1.021	0.966	1.020	0.954	1.016	0.931	1.008
	8	4.4	0.980	1.026	0.977	1.024	0.964	1.020	0.942	1.013
	10	5.6	0.989	1.029	0.986	1.027	0.973	1.023	0.950	1.015
	12	6.7	0.998	1.033	0.995	1.031	0.982	1.027	0.959	1.020
	14	7.7	1.007	1.036	1.004	1.034	0.991	1.030	0.967	1.022
	16	8.9	1.014	1.037	1.011	1.036	0.998	1.031	0.974	1.024
8000 feet	6	3.3	0.964	1.034	0.961	1.033	0.949	1.028	0.926	1.021
	8	4.4	0.975	1.037	0.971	1.036	0.959	1.031	0.936	1.024
	10	5.6	0.986	1.041	0.982	1.040	0.970	1.036	0.947	1.028
	12	6.7	0.995	1.044	0.991	1.043	0.979	1.038	0.955	1.031
	14	7.7	1.002	1.047	0.998	1.046	0.986	1.041	0.962	1.034
	16	8.9	1.009	1.050	1.005	1.049	0.993	1.044	0.969	1.037

Table 13, Capacity and Power Derates, Models AGZ 075 to 130

Altitude	Chilled Water Delta T		Fouling Factor							
			0.0001 (0.0176)		0.00025 (0.044)		0.00075 (0.132)		0.00175 (0.308)	
	°F	°C	Cap.	Power	Cap.	Power	Cap.	Power	Cap.	Power
Sea Level	6	3.3	0.990	0.997	0.976	0.994	0.937	0.983	0.868	0.964
	8	4.4	0.994	0.998	0.981	0.995	0.942	0.984	0.872	0.965
	10	5.6	1.000	1.000	0.987	0.996	0.947	0.986	0.877	0.967
	12	6.7	1.005	1.001	0.991	0.997	0.951	0.986	0.881	0.968
	14	7.7	1.009	1.002	0.995	0.998	0.955	0.987	0.884	0.968
	16	8.9	1.013	1.004	1.000	1.000	0.960	0.989	0.889	0.970
2000 feet	6	3.3	0.987	1.005	0.974	1.002	0.934	0.991	0.865	0.972
	8	4.4	0.992	1.006	0.979	1.003	0.940	0.992	0.870	0.973
	10	5.6	0.997	1.008	0.984	1.004	0.944	0.994	0.875	0.975
	12	6.7	1.002	1.009	0.989	1.005	0.949	0.994	0.879	0.975
	14	7.7	1.007	1.011	0.993	1.007	0.953	0.996	0.883	0.977
	16	8.9	1.011	1.012	0.998	1.008	0.958	0.997	0.887	0.978
4000 feet	6	3.3	0.985	1.014	0.972	1.010	0.933	0.999	0.864	0.980
	8	4.4	0.991	1.015	0.977	1.012	0.938	1.001	0.869	0.981
	10	5.6	0.995	1.016	0.982	1.013	0.943	1.002	0.873	0.982
	12	6.7	1.000	1.018	0.987	1.014	0.947	1.003	0.877	0.984
	14	6.8	1.005	1.019	0.991	1.015	0.951	1.004	0.881	0.985
	16	8.9	1.009	1.021	0.995	1.017	0.955	1.006	0.884	0.987
6000 feet	6	3.3	0.982	1.023	0.969	1.020	0.930	1.009	0.861	0.989
	8	4.4	0.988	1.025	0.975	1.022	0.935	1.010	0.866	0.991
	10	5.6	0.992	1.026	0.979	1.022	0.940	1.011	0.870	0.992
	12	6.7	0.997	1.028	0.984	1.024	0.944	1.013	0.875	0.994
	14	7.7	1.002	1.029	0.989	1.025	0.949	1.014	0.879	0.995
	16	8.9	1.006	1.031	0.992	1.027	0.952	1.016	0.882	0.996
8000 feet	6	3.3	0.979	1.034	0.966	1.031	0.927	1.019	0.859	1.000
	8	4.4	0.984	1.036	0.971	1.032	0.932	1.021	0.863	1.002
	10	5.6	0.990	1.037	0.976	1.033	0.937	1.022	0.868	1.002
	12	6.7	0.993	1.039	0.980	1.035	0.941	1.024	0.871	1.004
	14	7.7	0.998	1.041	0.985	1.037	0.945	1.026	0.875	1.006
	16	8.9	1.003	1.041	0.990	1.038	0.950	1.026	0.879	1.007

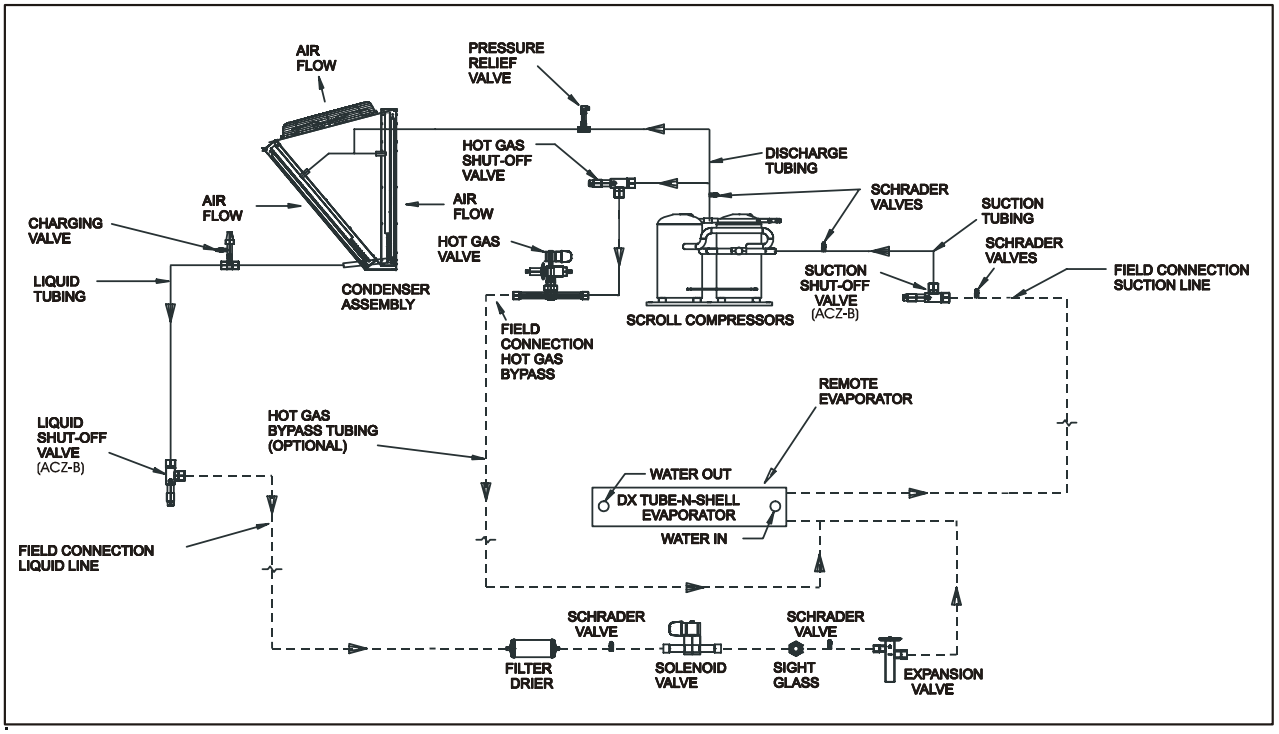
ACZ Compressor Staging

Temperature control for the evaporator is provided by the installer through a field supplied and wired temperature controller. The field supplied staging signals are field wired to the Microtech II controller that correspondingly activates and deactivates the scroll compressors. The field supplied temperature controller is required to close normally-open 24 volt contacts on a demand for cooling. These closure signals are field wired to the terminal strip (TB3) in the condensing unit. Refer to the field wiring diagram (page 49) for details. The following control staging is required:

Condensing Unit Model	Number of Capacity Steps	Number of Required Contact Closure Signals
ACZ-030B through 110B	4	4
ACZ-120B through 155B	6	6

Remote Evaporator Refrigerant Piping

Figure 20, AGZ-BM, Remote Evaporator Piping Schematic



Proper refrigerant piping can make the difference between a reliable system and an inefficient, problematic system. The primary concerns related to piping are refrigerant pressure drop, a solid liquid feed to the expansion valves, continuous oil return and properly sized refrigerant specialties.

The recommended source for refrigerant piping techniques and sizing is the ASHRAE 2002 Refrigeration Handbook, chapter 2.

Refrigerant specialties including the expansion valves, solenoid valves, filter-drier and sight glasses for use with the AGZ-BM remote evaporator models are supplied by McQuay but require field installation. No piping components are furnished on the ACZ condensing units. The remaining components including fittings and Schrader valves are provided and piped by the installer. The hot gas bypass valve with solenoid valve option can be provided as a field-installed or factory installed option.

The condensing unit section has a liquid line shut-off valve and a suction shut-off valve provided as standard. A holding charge of R-22 is provided for the evaporator (AGZ-BM) and the outdoor section. The installer must properly evacuate the piping system and provide the operating charge of R22. Refer to the piping schematic drawing on page 21 for additional details.

Although conflicting piping recommendations can be found in different sources, McQuay offers the following recommendations for these controversial issues.

The use of double risers for vertical gas risers is generally not required and should be used only as a last resort to maintain the minimum refrigerant flow to carry oil up the vertical risers. Slightly downsizing the vertical riser is a preferable option to providing double risers.

Slope the refrigerant lines 1" per 10 feet of horizontal run in the direction of refrigerant flow to assist oil return.

Resist using hot gas bypass for applications when operation in ambient temperature below 40 degrees is expected. This recommendation helps to maintain adequate condensing pressures and liquid refrigerant at the expansion valve when condenser capacities are at their maximum.

Pressure drops in the refrigerant lines should be maintained at or below the ASHRAE recommendations and line lengths should be made as short as possible. Exceeding these recommendations will decrease performance and could impact reliability.

Small traps should be provided at the base of each major vertical gas riser to assist in the collection of oil. If vertical risers exceed more than 25 feet, install a small trap at the midpoint and at a maximum of 20 foot intervals.

Use caution in sizing the liquid line in applications where the evaporator is above the outdoor section. The weight of the liquid refrigerant in the vertical column will decrease the pressure at the top of the riser (approximately 0.5 psi per foot of vertical rise) allowing some of the refrigerant to flash to a gas. Adequate refrigerant subcooling is needed at the outdoor section to prevent large volumes of refrigerant gas at the expansion valve.

The piping systems should always extend above the highest component in the refrigeration system before dropping down to make the final refrigerant connections to components. This practice will hinder the draining of condensed refrigerant to the lower component when normal shutdown procedures do not occur (such as a power failure).

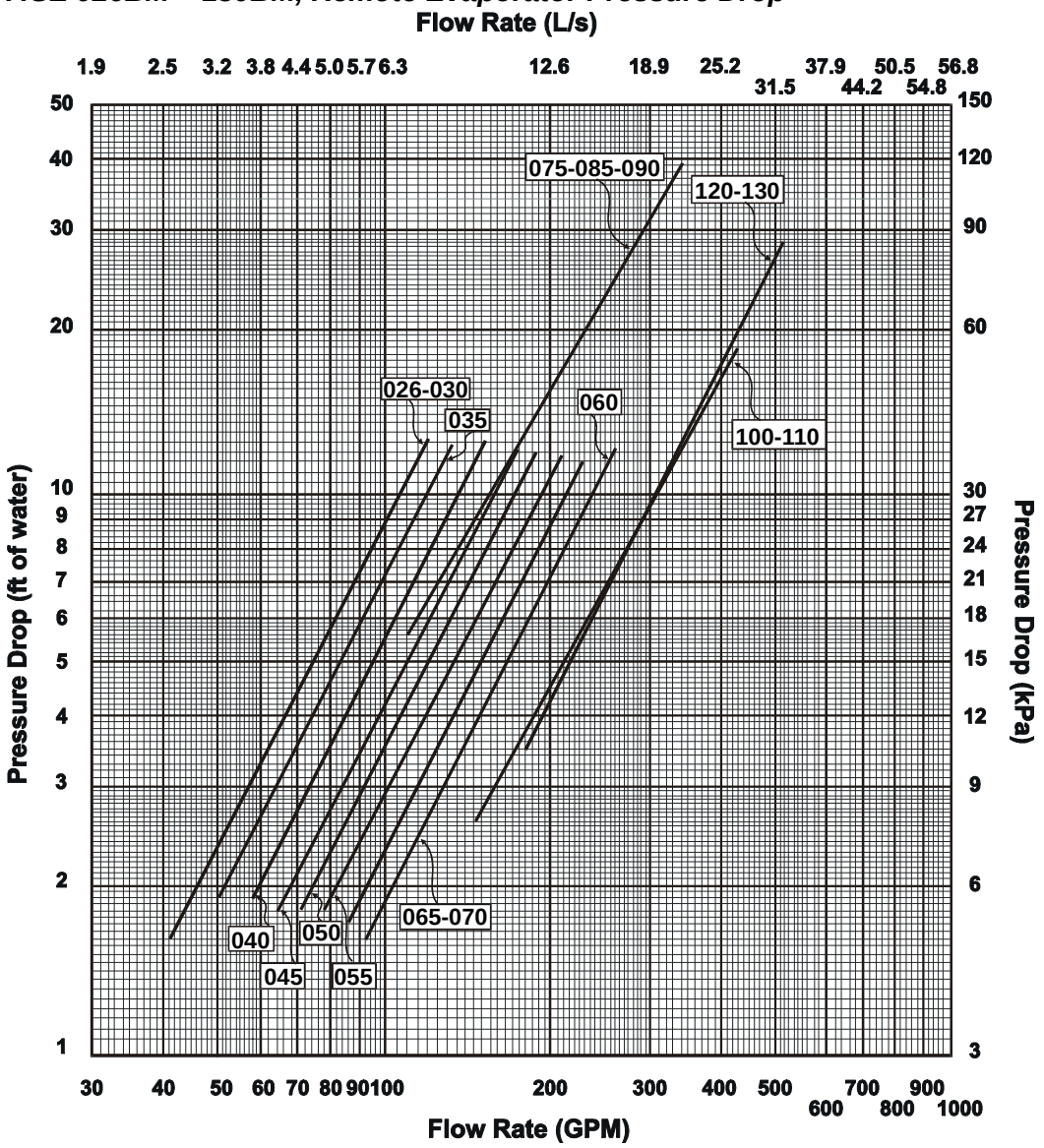
Pumpdown

The pumpdown capacity of ACZ/AGZ units is given in the Physical Data Tables. Care should be exercised to include all equipment and lines when calculating the system charge relative to the unit's pumpdown capacity. The AGZ-BM remote evaporators have an insignificant operating charge.

Evaporator Flow and Pressure Drop

The AGZ-BM remote evaporator flow rate must fall between the minimum and maximum values shown in the evaporator pressure drop table on the following page.

Figure 21, AGZ 026BM – 130BM, Remote Evaporator Pressure Drop



AGZ Unit Model	Minimum				Nominal				Maximum			
	Inch-Pound		S.I.		Inch-Pound		S.I.		Inch-Pound		S.I.	
	gpm	DP ft.	lps	DP kpa	gpm	DP ft.	lps	DP kpa	gpm	DP ft.	lps	DP kpa
026B	41	1.6	2.6	4.7	65	3.9	4.1	11.6	109	10.4	6.9	30.9
030B	45	1.9	2.9	5.7	72	4.7	4.6	14.1	121	12.7	7.6	37.8
035B	50	1.9	3.1	5.6	80	4.6	5.0	13.8	133	12.4	8.4	36.9
040B	58	1.9	3.6	5.7	92	4.7	5.8	14.0	154	12.6	9.7	37.5
045B	64	1.8	4.0	5.4	102	4.5	6.4	13.4	170	12.1	10.7	35.9
050B	71	1.8	4.4	5.4	113	4.5	7.1	13.3	188	12.0	11.9	35.7
055B	78	1.8	4.9	5.3	125	4.4	7.9	13.0	209	11.7	13.2	34.8
060B	86	1.7	5.4	5.2	137	4.3	8.6	12.8	228	11.5	14.4	34.2
065B	92	1.6	5.8	4.9	147	4.1	9.3	12.1	246	10.9	15.5	32.5
070B	98	1.9	6.2	5.6	157	4.6	9.9	13.7	262	12.3	16.5	36.8
075B	111	5.6	7.0	16.5	177	12.5	11.2	37.4	295	30.4	18.6	90.7
085B	119	6.3	7.5	18.9	191	14.3	12.1	42.7	318	34.8	20.1	103.6
090B	128	7.2	8.1	21.4	205	16.2	12.9	48.4	342	39.4	21.6	117.3
100B	146	2.6	9.2	7.7	234	6.1	14.8	18.2	390	15.5	24.6	46.2
110B	161	3.1	10.2	9.2	258	7.3	16.3	21.7	430	18.5	27.1	55.1
120B	180	3.5	11.3	10.4	288	8.9	18.1	26.5	479	24.6	30.2	73.4
130B	194	4.1	12.2	12.1	311	10.4	19.6	30.9	518	28.7	32.7	85.6

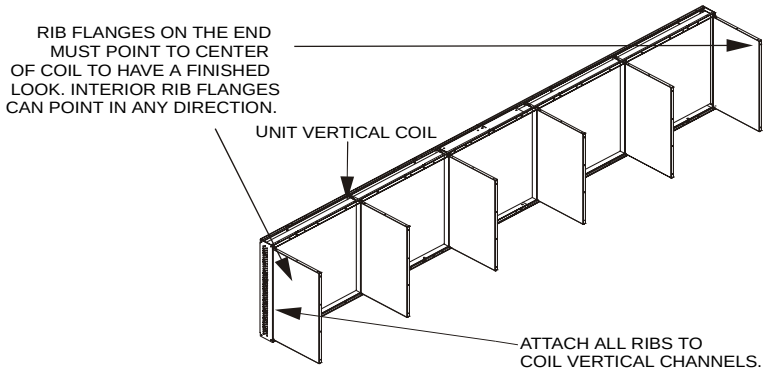
NOTE: Minimum and maximum flows are established to ensure the Delta-T for each unit size falls within the 6 - 16°F range for proper unit control.

Wind Baffles and Hail Guards

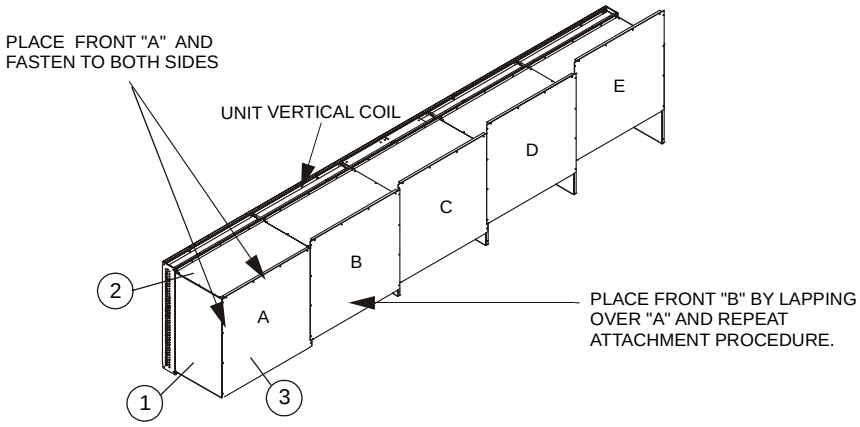
Wind Baffles/Hail Guards are a field-installed option that is used to stabilize unit operation in high wind areas and to assist in operation at low ambient temperatures. Figure 22 is a sketch of a typical panel assembly on an ACZ/AGZ unit. The actual number of panels and parts will vary by model size. The parts are shown in the table below and referenced by balloon numbers.

Figure 22, Installation Sequence

Rib Attachment (First)


RIB FLANGES ON THE END MUST POINT TO CENTER OF COIL TO HAVE A FINISHED LOOK. INTERIOR RIB FLANGES CAN POINT IN ANY DIRECTION.
UNIT VERTICAL COIL
ATTACH ALL RIBS TO COIL VERTICAL CHANNELS.

Front Panel Attachment (Second)



Top Panel Attachment (Last)

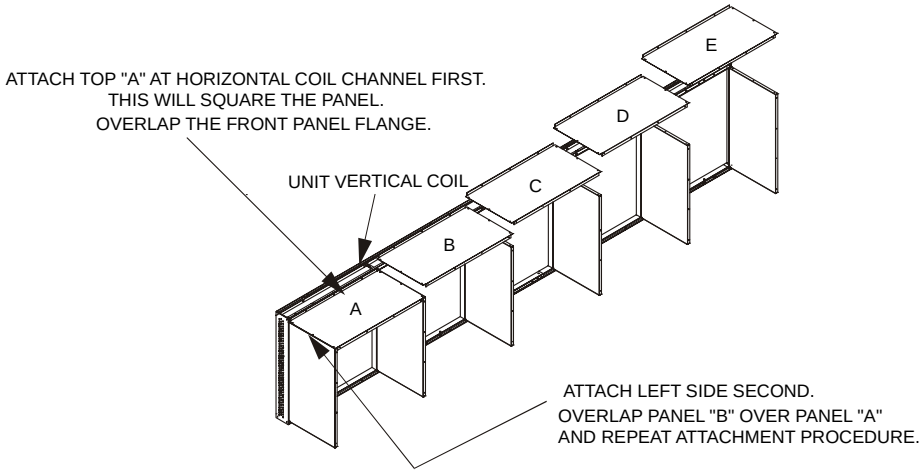
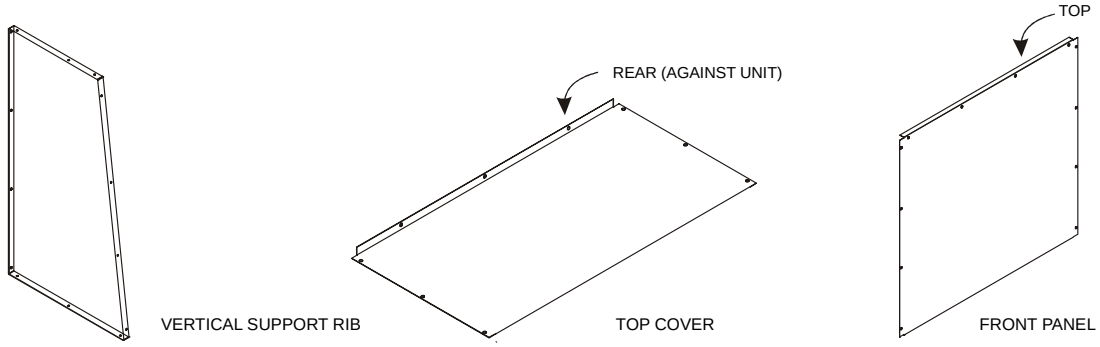
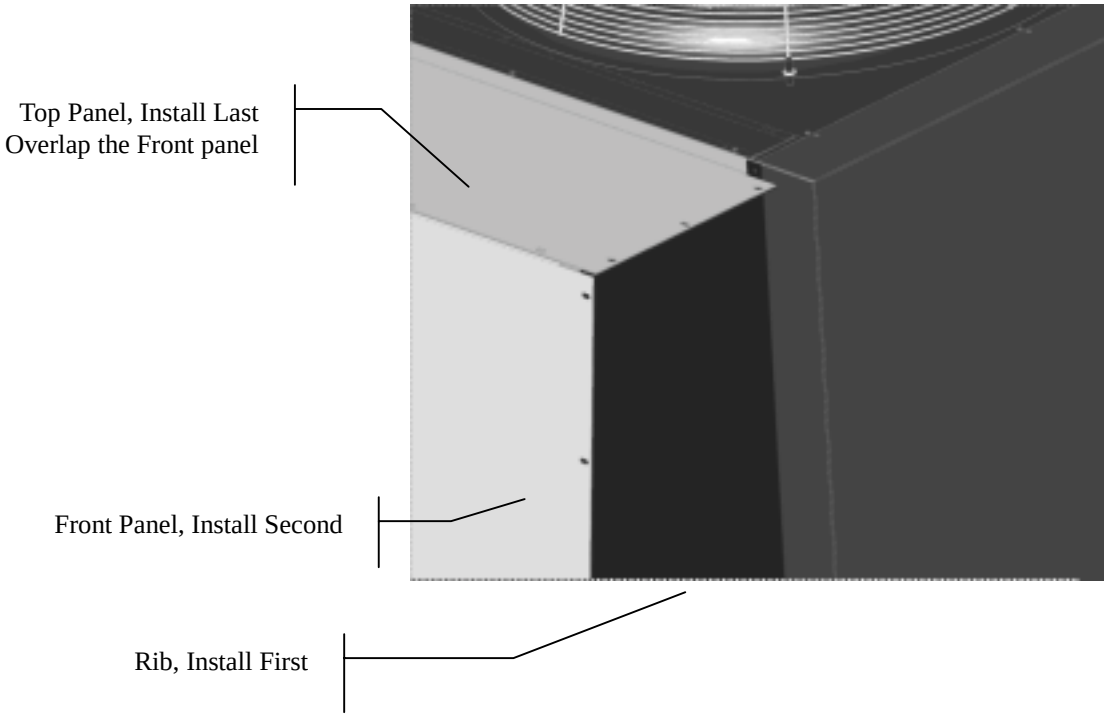

ATTACH TOP "A" AT HORIZONTAL COIL CHANNEL FIRST. THIS WILL SQUARE THE PANEL. OVERLAP THE FRONT PANEL FLANGE.
UNIT VERTICAL COIL
A
B
C
D
E
ATTACH LEFT SIDE SECOND. OVERLAP PANEL "B" OVER PANEL "A" AND REPEAT ATTACHMENT PROCEDURE.

Table 14, Packing List

Description	Part Number	Bubble Number
Vertical Support Rib	074758501	1
Top Cover	330409401	2
Front Panel	330409501	3
¼ - 20 x ½" Screw (Place in Poly Bag)	046093807	

Figure 23, Components





Physical Data

Table 15, ACZ 030B - 040B, AGZ 026BM – 035BM

PHYSICAL DATA	MODEL NUMBER					
	ACZ 030B, AGZ 026BM		ACZ 035B AGZ 030BM		ACZ 040B AGZ 035BM	
BASIC DATA	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**
Number Of Refrigerant Circuits	2		2		2	
Unit Operating Charge, R-22, Lbs.	22	22	22	27	27	27
Unit Operating Charge, R-22, kg	10	10	10	12	12	12
Cabinet Dimensions, LxWxH, In.	94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4	
Cabinet Dimensions, LxWxH, (mm)	2398 x 2235 x 2550		2398 x 2235 x 2550		2398 x 2235 x 2550	
Unit Operating Weight, Lb (kg)	3600 (1634)		3600 (1634)		3600 (1634)	
Unit Shipping Weight, Lb (kg)	3550 (1612)		3550 (1612)		3550 (1612)	
Add'l. Weight If Copper Finned Coils, Lb. (kg)	284 (129)		284 (129)		284 (129)	
COMPRESSORS						
Type	Tandem Scrolls		Tandem Scrolls		Tandem Scrolls	
Nominal tonnage of each Compressor	7.5	7.5	7.5	9.0	9.0	9.0
Number Of Compressors per Circuit	2	2	2	2	2	2
Oil Charge Per Compressor, Oz.	140	140	140	140	140	140
Oil Charge Per Compressor, (g)	(496)	(496)	(496)	(496)	(496)	(496)
CAPACITY REDUCTION STEPS - PERCENT OF COMPRESSOR DISPLACEMENT						
Staging, 4 Stages, Circuit #1 in Lead	0-25-50-75-100		0-23-50-73-100		0-25-50-75-100	
Staging, 4 Stages, Circuit #2 in Lead	0-25-50-75-100		0-27-50-77-100		0-25-50-75-100	
CONDENSERS - HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLING						
Coil Face Area Sq. Ft.	26.3	26.3	26.3	26.3	26.3	26.3
Coil Face Area, (M^2)	2.4	2.4	2.4	2.4	2.4	2.4
Finned Height x Finned Length, In.	50x75.6	50x75.6	50x75.6	50x75.6	50x75.6	50x75.6
Finned Height x Finned Length, (mm)	1270 x 1920	1270 x 1920	1270 x 1920	1270 x 1920	1270 x 1920	1270 x 1920
Fins Per Inch x Rows Deep	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3
Pumpdown Capacity, 90% Full Lbs. (kg)	49 (22)	49 (22)	49 (22)	49 (22)	49 (22)	49 (22)
Maximum Relief Valve Pressure Setting, psig (kPa)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)
CONDENSER FANS - DIRECT DRIVE PROPELLER TYPE						
Number Of Fans - Fan Diameter, In. (mm)	4 – 30 (762)		4 – 30 (762)		4 – 30 (762)	
Number Of Motors - HP (kW) (2)	4 – 1.0		4 – 1.0		4 – 1.0	
Fan And Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, FPM (M/Sec)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, CFM (M^3/sec)	24,316 (11,478)		24,316 (11,478)		24,316 (11,478)	
REMOTE EVAPORATOR - BRAZED PLATE (AGZ-BM ONLY)						
Number of Evaporators	1		1		1	
Number of Refrigerant Circuits	2		2		2	
Water Volume, Gallons, (L)	4.3 (16.4)		5.0 (18.9)		5.7 (21.4)	
Maximum Water Pressure, psig (kPa)	363 (2503)		363 (2503)		363 (2503)	
Max. Refrig. Working Pressure, psig (kPa)	450 (3102)		450 (3102)		450 (3102)	
Water Inlet / Outlet Victaulic Conn. In. (mm)	3 (76)		3 (76)		3 (76)	
Drain - NPT int., In. (mm)	Field		Field		Field	
Vent - NPT int., In. (mm)	Field		Field		Field	

NOTES:
1. Nominal capacity based on 95°F ambient air and 50°F SST.
2. Except for 380V/60 & 575V/60, HP = 2.0

Table 16, ACZ 045B - 060B, AGZ 040BM – 055BM

PHYSICAL DATA	MODEL NUMBER							
	ACZ 045B AGZ 040BM		ACZ 050B AGZ 045BM		ACZ 055B AGZ 050BM		ACZ 060B AGZ 055BM	
BASIC DATA	**Ckt.1**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.2**
Number Of Refrigerant Circuits	2		2		2		2	
Unit Operating Charge, R-22, lbs.	31	31	37	37	37	37	44	44
Unit Operating Charge, R-22, kg	14	14	17	17	17	17	20	20
Cabinet Dimensions, LxWxH, in.	94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4	
Cabinet Dimensions, LxWxH, (mm)	2398 x 2235 x 2250		2398 x 2235 x 2250		2398 x 2235 x 2250		2398 x 2235 x 2250	
Unit Operating Weight, Lbs. (kg)	3610 (1639)		3650 (1657)		3800 (1725)		3850 (1748)	
Unit Shipping Weight, Lbs. (kg)	3550 (1612)		3590 (1630)		3730 (1693)		3780 (1716)	
Add'l. Weight If Copper Finned Coils, lbs. (kg)	288 (130)		288 (130)		476 (130)		476 (130)	
COMPRESSORS								
Type	Tandem Scrolls		Tandem Scrolls		Tandem Scrolls		Tandem Scrolls	
Nominal tonnage of each Compressor	10.0	10.0	10.0	13.0	13.0	13.0	13.0	15.0
Number Of Compressors per Circuit	2	2	2	2	2	2	2	2
Oil Charge Per Compressor, oz.	140	140	140	140	140	140	140	140
Oil Charge Per Compressor, (g)	(496)	(496)	(496)	(496)	(496)	(496)	(496)	(496)
CAPACITY REDUCTION STEPS - PERCENT OF COMPRESSOR DISPLACEMENT								
Staging, 4 Stages, Circuit #1 in Lead	0-25-50-75-100		0-22-50-46-100		0-25-50-75-100		0-25-50-75-100	
Staging, 4 Stages, Circuit #2 in Lead	0-25-50-75-100		0-28-50-85-100		0-25-50-75-100		0-25-50-75-100	
CONDENSERS - HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLING								
Coil Face Area, sq. ft. (Note 1)	26.3	26.3	44.1	44.1	44.1	44.1	44.1	44.1
Coil Face Area (sq. M)	2.4	2.4	4.1	4.1	4.1	4.1	4.1	4.1
Finned Height x Finned Length, in.	50x75.6	50x75.6	42x75.6	42x75.6	42x75.6	42x75.6	42x75.6	42x75.6
Finned Height x Finned Length, (mm)	1270 x 1920	1270 x 1920	1067 x 1920	1067 x 1920	1067 x 1920	1067 x 1920	1067 x 1920	1067 x 1920
Fins Per Inch x Rows Deep	16 x 3	16 x 3	16 x 2	16 x 2	16 x 2	16 x 2	16 x 3	16 x 3
Pumpdown Capacity, 90% Full Lbs. (kg)	49 (22)	49 (22)	60(27)	60(27)	60(27)	60(27)	82 (37)	82 (37)
Maximum Relief Valve Pressure Setting, psig (kPa)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)
CONDENSER FANS - DIRECT DRIVE PROPELLER TYPE								
Number Of Fans - Fan Diameter, in. (mm)	4 – 30 (762)		4 – 30 (762)		4 – 30 (762)		4 – 30 (762)	
Number Of Motors - HP (kW) (Note 2))	4 – 1.5		4 – 1.5		4 – 1.5		4 – 1.5	
Fan And Motor RPM, 60Hz	1140		1140		1140		1140	
60 Hz Fan Tip Speed, FPM (m/sec)	8950 (4224)		8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, CFM (m^3/sec)	39,600 (18,692)		39,600 (18,692)		37,228 (17,572)		37,228 (17,572)	
REMOTE EVAPORATOR - BRAZED PLATE (AGZ-BM ONLY)								
Number of Evaporators	1		1		1		1	
Number of Refrigerant Circuits	2		2		2		2	
Water Volume, Gallons, (L)	6.3 (23.9)		7.2 (27.3)		8.1 (30.7)		9.2 (34.9)	
Maximum Water Pressure, psig (kPa)	363 (2503)		363 (2503)		363 (2503)		363 (2503)	
Maximum Refrigerant Working Pressure, psig (kPa)	450 (3102)		450 (3102)		450 (3102)		450 (3102)	
Water Inlet / Outlet Victaulic Conn., in. (mm)	3 (76)		3 (76)		3 (76)		3 (76)	
Drain - NPT int., in. (mm)	Field		Field		Field		Field	
Vent - NPT int., in. (mm)	Field		Field		Field		Field	

NOTES:
1. The AGZ 040 condenser is the same as the AGZ 045.
2. Except for 380V/60 & 575V/60, HP = 2.0

Table 17, ACZ 065B - 080B, AGZ 060BM – 070BM

PHYSICAL DATA	MODEL NUMBER					
	ACZ 065B AGZ 060BM		ACZ 070B AGZ 065BM		ACZ 080B AGZ 070BM	
BASIC DATA	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**
Number Of Refrigerant Circuits	2		2		2	
Unit Operating Charge, R-22, lbs.	44	44	50	57	57	57
Unit Operating Charge, R-22, kg	20	20	23	26	26	26
Cabinet Dimensions, LxWxH, in.	94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4		94.4 x 88.0 x 100.4	
Cabinet Dimensions, LxWxH, (mm)	2398 x 2235 x 2550		2398 x 2235 x 2550		2398 x 2235 x 2550	
Unit Operating Weight, Lbs. (kg)	4040 (1834)		4070 (1848)		4180 (1898)	
Unit Shipping Weight, Lbs. (kg)	3820 (1734)		3970 (1802)		4080 (1852)	
Add'l Weight If Copper Finned Coils, lbs. (kg)	476 (216)		568 (258)		568 (258)	
COMPRESSORS						
Type	Tandem Scrolls		Tandem Scrolls		Tandem Scrolls	
Nominal tonnage of each Compressor	15.0	15.0	15.0	15 / 20	15 / 20	15 / 20
Number Of Compressors per Circuit	2	2	2	2	2	2
Oil Charge Per Compressor, oz.	140	140	140	140 /148	140 /148	140 /148
Oil Charge Per Compressor, (g)	(496)	(496)	(496)	496/ 525	496/ 525	496/ 525
CAPACITY REDUCTION STEPS - PERCENT OF COMPRESSOR DISPLACEMENT						
Staging, 4 Stages, Circuit #1 in Lead	0-25-50-75-100		0-23-46-77-100		0-25-50-75-100	
Staging, 4 Stages, Circuit #2 in Lead	0-25-50-75-100		0-31-46-69-100		0-25-50-75-100	
CONDENSERS - HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLING						
Coil Face Area, sq. ft.	44.1	44.1	52.6	52.6	52.6	52.6
Coil Face Area, (m^2)	4.1	4.1	4.9	4.9	4.9	4.9
Finned Height x Finned Length, in.	42x75.6	42x75.6	100x75.6	100x75.6	100x75.6	100x75.6
Finned Height x Finned Length, (mm)	1067 x 1920	1067 x 1920	2540 x 1920	2540 x 1920	2540 x 1920	2540 x 1920
Fins Per Inch x Rows Deep	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3
Pumpdown Capacity, 90% Full Lbs. (kg)	82 (37	82 (37	98 (44	98 (44	98 (44	98 (44
Maximum Relief Valve Pressure Setting, psig (kPa)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)
CONDENSER FANS - DIRECT DRIVE PROPELLER TYPE						
Number Of Fans - Fan Diameter, in. (mm)	4 – 30 (762)		4 – 30 (762)		4 – 30 (762)	
Number Of Motors - HP (kW) (1)	4 – 1.5		4 – 2.0		4 – 2.0	
Fan And Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, FPM (m/sec)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, CFM (m^3/sec)	37,228 (17,572		43,452 (20,510)		43,452 (20,510)	
REMOTE EVAPORATOR - BRAZED PLATE (AGZ-BM ONLY)						
Number of Evaporators	1		1		1	
Number of Refrigerant Circuits	2		2		2	
Water Volume, Gallons, (L)	9.2 (34.9)		11.2 (42.5)		11.2 (42.5)	
Maximum Water Pressure, psig (kPa)	363 (2503)		363 (2503)		363 (2503)	
Maximum Refrigerant Working Press., psig (kPa)	450 (3102)		450 (3102)		450 (3102)	
Water Inlet / Outlet Victaulic Conn., in. (mm)	3 (76)		3 (76)		3 (76)	
Drain - NPT int, in. (mm)	Field		Field		Field	
Vent - NPT int, in. (mm)	Field		Field		Field	

NOTE: Except for 380V/60 & 575V/60, HP = 2.0

Table 18, ACZ 090B - 110B, AGZ 075BM – 090BM

PHYSICAL DATA	MODEL NUMBER					
	ACZ 090B AGZ 075BM		ACZ 100B AGZ 085BM		ACZ 110B AGZ 090BM	
BASIC DATA	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**
Number Of Refrigerant Circuits	2		2		2	
Unit Operating Charge, R-22, lbs.	56	56	56	66	66	66
Unit Operating Charge, R-22, (kg)	25	25	25	30	30	30
Cabinet Dimensions, LxWxH, in.	134.9 x 88.0 x 100.4		134.9 x 88.0 x 100.4		134.9 x 88.0 x 100.4	
Cabinet Dimensions, LxWxH, (mm)	3426 x 2235 x 2550		3426 x 2235 x 2550		3426 x 2235 x 2550	
Unit Operating Weight, Lbs. (kg)	5630 (2556)		5790 (2629)		5950 (2701)	
Unit Shipping Weight, Lbs. (kg)	5510 (2502)		5670 (2574)		5830 (2647)	
Add'l Weight If Copper Finned Coils, lbs. (kg)	870 (395)		870 (395)		870 (395)	
COMPRESSORS						
Type	Tandem Scrolls		Tandem Scrolls		Tandem Scrolls	
Nominal tonnage of each Compressor	20.0	20.0	20.0	25.0	25.0	25.0
Number Of Compressors per Circuit	2	2	2	2	2	2
Oil Charge Per Compressor, oz.	148	148	148	200	200	200
Oil Charge Per Compressor, (g)	(525)	(525)	(525)	(709)	(709)	(709)
CAPACITY REDUCTION STEPS - PERCENT OF COMPRESSOR DISPLACEMENT						
Staging, 4 Stages, Circuit #1 in Lead	0-25-50-75-100		0-22-50-72-100		0-25-50-75-100	
Staging, 4 Stages, Circuit #2 in Lead	0-25-50-75-100		0-28-50-78-100		0-25-50-75-100	
CONDENSERS - HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLING						
Coil Face Area, sq. ft.	78.8	78.8	78.8	78.8	78.8	78.8
Coil Face Area, (m^2)	7.3	7.3	7.3	7.3	7.3	7.3
Finned Height x Finned Length, in.	50 x113.4	50 x113.4	50 x113.4	50 x113.4	50 x113.4	50 x113.4
Finned Height x Finned Length, (mm)	1270 x 2880	1270 x 2880	1270 x 2880	1270 x 2880	1270 x 2880	1270 x 2880
Fins Per Inch x Rows Deep	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3
Pumpdown Capacity, 90% Full Lbs. (kg)	147 (67)	147 (67)	147 (67)	147 (67)	147 (67)	147 (67)
Maximum Relief Valve Pressure Setting, psig (kPa)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)
CONDENSER FANS - DIRECT DRIVE PROPELLER TYPE						
Number Of Fans - Fan Diameter, in. (mm)	6 – 30 (762)		6 – 30 (762)		6 – 30 (762)	
Number Of Motors - HP (kW)	6 – 2.0		6 – 2.0		6 – 2.0	
Fan And Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, FPM (m/sec)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, CFM (m^3/sec)	65,178 (30,765)		65,178 (30,765)		65,178 (30,765)	
REMOTE EVAPORATOR - SHELL AND TUBE (AGZ-BM ONLY)						
Number of Evaporators	1		1		1	
Number of Refrigerant Circuits	2		2		2	
Diameter, in. - Length, ft.	14.0 x 5.2		14.0 x 5.2		14.0 x 5.2	
Diameter, (mm) – Length, (mm)	356 x 1585		356 x 1585		356 x 1585	
Water Volume, Gallons, (L)	25 (95)		25 (95)		25 (95)	
Maximum Water Pressure, psig (kPa)	152 (1047)		152 (1047)		152 (1047)	
Maximum Refrigerant Working Pressure, psig (kPa)	300 (2066)		300 (2066)		300 (2066)	
Water Inlet / Outlet Victaulic Connections, in. (mm)	5 (127)		5 (127)		5 (127)	
Drain - NPT int, in. (mm)	0.5 (12.7)		0.5 (12.7)		0.5 (12.7)	
Vent - NPT int, in. (mm)	0.5 (12.7)		0.5 (12.7)		0.5 (12.7)	

Table 19, ACZ 120B - 155B, AGZ 100BM – 130BM

PHYSICAL DATA	MODEL NUMBER							
	ACZ 120B AGZ 100BM		ACZ 130B AGZ 110BM		ACZ 140B AGZ 120BM		ACZ 155B AGZ 130BM	
BASIC DATA	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**	**Ckt.1**	**Ckt.2**
Number Of Refrigerant Circuits	2		2		2		2	
Unit Operating Charge, R-22, lbs.	72	82	82	82	82	99	99	99
Unit Operating Charge, R-22, (kg)	33	37	37	37	37	45	45	45
Cabinet Dimensions, LxWxH, in.	173.1 x 88.0 x 100.4		173.1 x 88.0 x 100.4		173.1 x 88.0 x 100.4		173.1 x 88.0 x 100.4	
Cabinet Dimensions, LxWxH, (mm)	4397 x 2235 x 2550		4397 x 2235 x 2550		4397 x 2235 x 2550		4397 x 2235 x 2550	
Unit Operating Weight, Lbs. (kg)	6970 (3164		7230 (3282)		7480 (3396)		7760 (3523)	
Unit Shipping Weight, Lbs. (kg)	6820 (3096)		7080 (3214)		7360 (3341)		7640 (3469)	
Add'l. Weight If Copper Finned Coils, lbs. (kg)	1155 (524)		1155 (524)		1155 (524)		1155 (524)	
COMPRESSORS								
Type	Trio Scrolls		Trio Scrolls		Trio Scrolls		Trio Scrolls	
Nominal tonnage of each Compressor	15.0	20.0	20.0	20.0	20.0	25.0	25.0	25.0
Number Of Compressors per Circuit	3	3	3	3	3	3	3	3
Oil Charge Per Compressor, oz.	140	148	148	148	148	200	200	200
Oil Charge Per Compressor, (g)	(496)	(525)	(525)	(525)	(525)	(709)	(709)	(709)
CAPACITY REDUCTION STEPS - PERCENT OF COMPRESSOR DISPLACEMENT								
Staging, 6 Stages, Circuit #1 in Lead	0-14-33-48-67-81-100		0-17-33-50-67-83-100		0-15-33-48-67-81-100		0-17-33-50-67-83-100	
Staging, 6 Stages, Circuit #2 in Lead	0-19-33-52-67-86-100		0-17-33-50-67-83-100		0-19-33-52-67-86-100		0-17-33-50-67-83-100	
CONDENSERS - HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLING								
Coil Face Area, sq. ft.	105.3	105.3	105.3	105.3	105.3	105.3	105.3	105.3
Coil Face Area, (m^2)	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Finned Height x Finned Length, in.	50 x151.6	50 x151.6	50 x151.6	50 x151.6	50 x151.6	50 x151.6	50 x151.6	50 x151.6
Finned Height x Finned Length, (mm)	1270 x 3851	1270 x 3851	1270 x 3851	1270 x 3851	1270 x 3851	1270 x 3851	1270 x 3851	1270 x 3851
Fins Per Inch x Rows Deep	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3	16 x 3
Pumpdown Capacity, 90% Full Lbs. (kg)	196 (89)	196 (89)	196 (89)	196 (89)	196 (89)	196 (89)	196 (89)	196 (89)
Maximum Relief Valve Pressure Setting, psig (kPa)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)	450 (3103)
CONDENSER FANS - DIRECT DRIVE PROPELLER TYPE								
Number Of Fans - Fan Diameter, in. (mm)	8 – 30 (762)		8 – 30 (762)		8 – 30 (762)		8 – 30 (762)	
Number Of Motors - HP (kW)	8 – 2.0		8 – 2.0		8 – 2.0		8 – 2.0	
Fan And Motor RPM, 60Hz	1140		1140		1140		1140	
60 Hz Fan Tip Speed, FPM (m/sec)	8950 (4224)		8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, CFM (m^3/sec)	86,904 (41,020)		86,904 (41,020)		86,904 (41,020)		86,904 (41,020)	
REMOTE EVAPORATOR - SHELL AND TUBE (AGZ-BM ONLY)								
Number of Evaporators	1		1		1		1,	
Number of Refrigerant Circuits	2		2		2		2	
Diameter, in. - Length, ft.	12.8 x 7.9		12.8 x 7.9		14.0 x 8.0		14.0 x 8.0	
Diameter, (mm) – Length, (mm)	324 x 2408		324 x 2408		356 x 2438		356 x 2438	
Water Volume, Gallons, (L)	34 (127)		34 (127)		40 (150)		40 (150)	
Maximum Water Pressure, psig (kPa)	152 (1047)		152 (1047)		152 (1047)		152 (1047)	
Maximum Refrigerant Working Press., psig (kPa)	300 (2066)		300 (2066)		300 (2066)		300 (2066)	
Water Inlet / Outlet Victaulic Conn., in. (mm)	5 (127)		5 (127)		5 (127)		5 (127)	
Drain - NPT int., in. (mm)	0.5 (12.7)		0.5 (12.7)		0.5 (12.7)		0.5 (12.7)	
Vent - NPT int., in. (mm)	0.5 (12.7)		0.5 (12.7)		0.5 (12.7)		0.5 (12.7)	

Electrical Data Standard Ambient

Table 20, ACZ BC & AGZ BM Electrical Data, Single Point (105°F & below)

ACZ Unit Size	AGZ Unit Size	Volts	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd. Fuse Or HACR Breaker Size	Max. Fuse Or HACR Breaker Size
				Quantity	Wire Gauge 75C		
		208	133	3	1/0	150	150
		230	126	3	#1	150	150
030B	**026B**	380	80	3	#4	90	90
		460	68	3	#4	80	80
		575	52	3	#6	60	60
		208	146	3	1/0	175	175
		230	143	3	1/0	175	175
035B	**030B**	380	88	3	#3	100	100
		460	74	3	#4	80	90
		575	58	3	#6	70	70
		208	158	3	2/0	175	175
		230	150	3	1/0	175	175
040B	**035B**	380	96	3	#3	110	110
		460	79	3	#4	90	90
		575	64	3	#6	70	70
		208	167	3	2/0	200	200
		230	167	3	2/0	200	200
045B	**040B**	380	113	3	#2	125	125
		460	81	3	#4	90	90
		575	70	3	#4	80	80
		208	184	3	3/0	225	225
		230	184	3	3/0	225	225
050B	**045B**	380	121	3	#1	125	125
		460	94	3	#3	110	110
		575	78	3	#4	90	90
		208	199	3	3/0	225	225
		230	199	3	3/0	225	225
055B	**050B**	380	127	3	#1	150	150
		460	104	3	#2	125	125
		575	86	3	#3	100	100
		208	221	3	4/0	250	250
		230	214	3	4/0	250	250
060B	**055B**	380	145	3	1/0	175	175
		460	108	3	#2	125	125
		575	96	3	#3	110	110
		208	248	3	250	300	300
		230	228	3	4/0	250	250
065B	**060B**	380	156	3	2/0	175	175
		460	112	3	#2	150	150
		575	105	3	#2	125	125
		208	281	3	300	350	350
		230	281	3	300	350	350
070B	**065B**	380	162	3	2/0	200	200
		460	124	3	#1	150	150
		575	109	3	#2	125	125
		208	301	3	350	350	350
		230	301	3	350	350	350
080B	**070B**	380	168	3	2/0	200	200
		460	130	3	#1	150	150
		575	112	3	#2	125	125

NOTES:

1. Units operating in ambient temperatures of 95°F (35°C) and above must use the Maximum Fuse or HACR Breaker size.
2. All Electrical Data notes are on page 47.
3. Conduit hubs are not provided.

Table 21, ACZ BC & AGZ BM Compressor & Fan Motor Amps, Single & Multi-Point (Up to 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Rated Load Amps							No. Of Fan Motors	Locked Rotor Amps						
			Compressors						F.L.Amps Fan Motors (Each)		Fan Motors (Each)	Compressors Across-The-Line					
			No. 1	No. 3	No. 5	No. 2	No. 4	No. 6				No.1	No. 3	No. 5	No.2	No.4	No. 6
030B	026B	208	25.7	25.7	-	25.7	25.7	-	5.8	4	23.3	189	189	-	189	189	-
		230	24.2	24.2	-	24.2	24.2	-	5.8	4	26.1	189	189	-	189	189	-
		380	14.9	14.9	-	14.9	14.9	-	4.1	4	20.0	112	112	-	112	112	-
		460	13.4	13.4	-	13.4	13.4	-	2.8	4	13.0	99	99	-	99	99	-
		575	9.3	9.3	-	9.3	9.3	-	3.0	4	14.0	74	74	-	74	74	-
035B	030B	208	25.7	25.7	-	31.8	31.8	-	5.8	4	23.3	189	189	-	232	232	-
		230	24.2	24.2	-	31.8	31.8	-	5.8	4	26.1	189	189	-	232	232	-
		380	14.9	14.9	-	18.6	18.6	-	4.1	4	20.0	112	112	-	144	144	-
		460	13.4	13.4	-	16.0	16.0	-	2.8	4	13.0	99	99	-	125	125	-
		575	9.3	9.3	-	12.2	12.2	-	3.0	4	14.0	74	74	-	100	100	-
040B	035B	208	31.8	31.8	-	31.8	31.8	-	5.8	4	23.3	232	232	-	232	232	-
		230	29.9	29.9	-	29.9	29.9	-	5.8	4	26.1	232	232	-	232	232	-
		380	18.6	18.6	-	18.6	18.6	-	4.1	4	20.0	144	144	-	144	144	-
		460	16.0	16.0	-	16.0	16.0	-	2.8	4	13.0	125	125	-	125	125	-
		575	12.2	12.2	-	12.2	12.2	-	3.0	4	14.0	100	100	-	100	100	-
045B	040B	208	33.8	33.8	-	33.8	33.8	-	5.8	4	23.3	278	278	-	278	278	-
		230	33.8	33.8	-	33.8	33.8	-	5.8	4	26.1	278	278	-	278	278	-
		380	22.8	22.8	-	22.8	22.8	-	4.1	4	20.0	151	151	-	151	151	-
		460	16.5	16.5	-	16.5	16.5	-	2.8	4	13.0	127	127	-	127	127	-
		575	13.7	13.7	-	13.7	13.7	-	3.0	4	14.0	100	100	-	100	100	-
050B	045B	208	33.8	33.8	-	41.4	41.4	-	5.8	4	23.3	278	278	-	350	350	-
		230	33.8	33.8	-	41.4	41.4	-	5.8	4	26.1	278	278	-	350	350	-
		380	22.8	22.8	-	26.0	26.0	-	4.1	4	20.0	151	151	-	195	195	-
		460	16.5	16.5	-	21.8	21.8	-	2.8	4	13.0	127	127	-	158	158	-
		575	13.7	13.7	-	17.3	17.3	-	3.0	4	14.0	100	100	-	125	125	-
055B	050B	208	41.4	41.4	-	41.4	41.4	-	5.8	4	23.3	350	350	-	350	350	-
		230	41.4	41.4	-	41.4	41.4	-	5.8	4	26.1	350	350	-	350	350	-
		380	26.0	26.0	-	26.0	26.0	-	4.1	4	20.0	195	195	-	195	195	-
		460	21.8	21.8	-	21.8	21.8	-	2.8	4	13.0	158	158	-	158	158	-
		575	17.3	17.3	-	17.3	17.3	-	3.0	4	14.0	125	125	-	125	125	-
060B	055B	208	41.0	41.0	-	51.3	51.3	-	5.8	4	23.3	350	350	-	425	425	-
		230	41.0	41.0	-	48.1	48.1	-	5.8	4	26.1	350	350	-	425	425	-
		380	26.0	26.0	-	33.8	33.8	-	4.1	4	20.0	195	195	-	239	239	-
		460	21.8	21.8	-	23.7	23.7	-	2.8	4	13.0	158	158	-	187	187	-
		575	17.3	17.3	-	21.8	21.8	-	3.0	4	14.0	125	125	-	148	148	-
065B	060B	208	52.8	52.8	-	52.8	52.8	-	5.8	4	23.3	425	425	-	425	425	-
		230	48.1	48.1	-	48.1	48.1	-	5.8	4	26.1	425	425	-	425	425	-
		380	32.7	32.7	-	32.7	32.7	-	4.1	4	20.0	239	239	-	239	239	-
		460	23.7	23.7	-	23.7	23.7	-	2.8	4	13.0	187	187	-	187	187	-
		575	21.8	21.8	-	21.8	21.8	-	3.0	4	14.0	148	148	-	148	148	-
070B	065B	208	52.8	52.8	-	52.8	73.1	-	7.8	4	31.7	425	425	-	425	505	-
		230	52.8	52.8	-	52.8	73.1	-	7.8	4	35.6	425	425	-	425	505	-
		380	32.7	32.7	-	32.7	38.2	-	4.1	4	20.0	239	239	-	239	280	-
		460	23.7	23.7	-	23.7	30.1	-	3.6	4	17.8	187	187	-	187	225	-
		575	21.8	21.8	-	21.8	25.2	-	3.0	4	14.0	148	148	-	148	180	-
080B	070B	208	52.8	73.1	-	52.8	73.1	-	7.8	4	31.7	425	505	-	425	505	-
		230	52.8	73.1	-	52.8	73.1	-	7.8	4	35.6	425	505	-	425	505	-
		380	32.7	38.2	-	32.7	38.2	-	4.1	4	20.0	239	280	-	239	280	-
		460	23.7	30.1	-	23.7	30.1	-	3.6	4	17.8	187	225	-	187	225	-
		575	21.8	25.2	-	21.8	25.2	-	3.0	4	14.0	148	180	-	148	180	-

All Electrical Data notes are on page 47

Table 22, ACZ BC & AGZ BM Field Wiring, Single Point

ACZ Unit Size	AGZ Unit Size	Volts	Wiring to Standard Power Block		Wiring to Optional Non-Fused Disconnect Switch	
			Terminal Amps	Connector Wire Range (Copper Wire Only)	Disconnect Size	Connector Wire Range (Copper Wire Only)
030B	**026B**	208	175	14 GA – 2/0	225	# 4 - 300 kcmil
		230	175	14 GA – 2/0	225	# 4 - 300 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
035B	**030B**	208	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		230	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
040B	**035B**	208	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		230	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
045B	**040B**	208	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		230	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
050B	**045B**	208	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		230	380	#4 – 500 kcmil	225	# 4 - 300 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
055B	**050B**	208	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		230	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		380	175	14 GA – 2/0	150	# 4 - 300 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
060B	**055B**	208	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		230	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		380	175	14 GA – 2/0	250	#6 - 350 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
065B	**060B**	208	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		230	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		460	175	14 GA – 2/0	150	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
070B	**065B**	208	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		230	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		460	175	14 GA – 2/0	250	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil
080B	**070B**	208	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		230	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		460	380	#4 – 500 kcmil	250	# 4 - 300 kcmil
		575	175	14 GA – 2/0	150	# 4 - 300 kcmil

All Electrical Data notes are on page 47.

Table 23, ACZ BC & AGZ BM Electrical Wiring, Single Point (Up to 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd. Fuse Or HACR Breaker Size	Max. Fuse Or HACR Breaker Size
				Quantity	Wire Gauge 75C		
		208	358	6	4/0	400	400
		230	358	6	4/0	400	400
090B	**075B**	380	187	3	3/0	225	225
		460	150	3	1/0	175	175
		575	125	3	#1	150	150
		208	380	6	250	450	450
		230	380	6	250	450	450
100B	**085B**	380	219	3	250	250	250
		460	171	3	2/0	200	200
		575	136	3	1/0	150	150
		208	414	6	300	500	500
		230	414	6	300	500	500
110B	**090B**	380	248	3	250	300	300
		460	188	3	3/0	225	225
		575	146	3	1/0	175	175
		208	463	6	350	500	500
		230	463	6	300	500	500
120B	**100B**	380	260	3	300	300	300
		460	199	3	3/0	225	225
		575	171	3	2/0	175	175
		208	528	6 - (2)	300	600	600
		230	528	6 - (2)	300	600	600
130B	**110B**	380	282	3	300	300	300
		460	220	3	4/0	250	250
		575	182	3	3/0	200	200
		208	613	6 - (2)	350	700	700
		230	613	6 - (2)	350	700	700
140B	**120B**	380	323	3	400	350	350
		460	248	3	250	250	250
		575	198	3	3/0	225	225
		208	613	6 - (2)	350	700	700
		230	613	6 - (2)	350	700	700
155B	**130B**	380	361	6	4/0	400	400
		460	273	3	300	300	300
		575	212	3	4/0	225	225

NOTES:
1. Units operating in ambient temperatures of 95°F (35°C) and above must use the Maximum Fuse or HACR Breaker size.
2. All Electrical Data notes are on page 47.
3. (2) indicates that two conduits are required.
4. Conduit hubs are not supplied.

Table 24, ACZ BC & AGZ BM Compressor and Fan Motor Amps, Single and Multi-Point (Up to 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Rated Load Amps							No. Of Fan Motors	Locked Rotor Amps						
			Compressors						F.L. Amps Fan Motors (Each)		Fan Motors (Each)	Compressors Across-The-Line					
			No. 1	No. 3	No. 5	No. 2	No. 4	No. 6				No.1	No. 3	No. 5	No.2	No.4	No. 6
090B	**075B**	208	73.1	73.1	-	73.1	73.1	-	7.8	6	31.7	505	505	-	505	505	-
		230	73.1	73.1	-	73.1	73.1	-	7.8	6	35.6	505	505	-	505	505	-
		380	38.2	38.2	-	38.2	38.2	-	4.1	6	20.0	280	280	-	280	280	-
		460	30.1	30.1	-	30.1	30.1	-	3.6	6	17.8	225	225	-	225	225	-
		575	25.2	25.2	-	25.2	25.2	-	3.0	6	14.0	180	180	-	180	180	-
100B	**085B**	208	73.1	73.1	-	83.3	83.3	-	7.8	6	31.7	505	505	-	500	500	-
		230	73.1	73.1	-	83.3	83.3	-	7.8	6	35.6	505	505	-	500	500	-
		380	38.2	38.2	-	52.5	52.5	-	4.1	6	20.0	280	280	-	305	305	-
		460	30.1	30.1	-	39.0	39.0	-	3.6	6	17.8	225	225	-	250	250	-
		575	25.2	25.2	-	30.0	30.0	-	3.0	6	14.0	180	180	-	198	198	-
110B	**090B**	208	86.4	86.4	-	86.4	86.4	-	7.8	6	31.7	500	500	-	500	500	-
		230	86.4	86.4	-	86.4	86.4	-	7.8	6	35.6	500	500	-	500	500	-
		380	52.5	52.5	-	52.5	52.5	-	4.1	6	20.0	305	305	-	305	305	-
		460	39.0	39.0	-	39.0	39.0	-	3.6	6	17.8	250	250	-	250	250	-
		575	30.0	30.0	-	30.0	30.0	-	3.0	6	14.0	198	198	-	198	198	-
120B	**100B**	208	52.8	52.8	52.8	74.5	74.5	74.5	7.8	8	31.7	425	425	425	505	505	505
		230	52.8	52.8	52.8	74.5	74.5	74.5	7.8	8	35.6	425	425	425	505	505	505
		380	32.7	32.7	32.7	39.8	39.8	39.8	4.1	8	20.0	239	239	239	280	280	280
		460	23.7	23.7	23.7	30.6	30.6	30.6	3.6	8	17.8	187	187	187	225	225	225
		575	21.8	21.8	21.8	25.2	25.2	25.2	3.0	8	14.0	148	148	148	180	180	180
130B	**110B**	208	74.5	74.5	74.5	74.5	74.5	74.5	7.8	8	31.7	505	505	505	505	505	505
		230	74.5	74.5	74.5	74.5	74.5	74.5	7.8	8	35.6	505	505	505	505	505	505
		380	39.8	39.8	39.8	39.8	39.8	39.8	4.1	8	20.0	280	280	280	280	280	280
		460	30.6	30.6	30.6	30.6	30.6	30.6	3.6	8	17.8	225	225	225	225	225	225
		575	25.2	25.2	25.2	25.2	25.2	25.2	3.0	8	14.0	180	180	180	180	180	180
140B	**120B**	208	87.9	87.9	87.9	88.0	88.0	88.0	7.8	8	31.7	505	505	505	500	500	500
		230	87.9	87.9	87.9	88.0	88.0	88.0	7.8	8	35.6	505	505	505	500	500	500
		380	39.8	39.8	39.8	52.5	52.5	52.5	4.1	8	20.0	280	280	280	305	305	305
		460	30.6	30.6	30.6	39.0	39.0	39.0	3.6	8	17.8	225	225	225	250	250	250
		575	25.2	25.2	25.2	30.0	30.0	30.0	3.0	8	14.0	180	180	180	198	198	198
155B	**130B**	208	88.0	88.0	88.0	88.0	88.0	88.0	7.8	8	31.7	500	500	500	500	500	500
		230	88.0	88.0	88.0	88.0	88.0	88.0	7.8	8	35.6	500	500	500	500	500	500
		380	52.5	52.5	52.5	52.5	52.5	52.5	4.1	8	20.0	305	305	305	305	305	305
		460	39.0	39.0	39.0	39.0	39.0	39.0	3.6	8	17.8	250	250	250	250	250	250
		575	30.0	30.0	30.0	30.0	30.0	30.0	3.0	8	14.0	198	198	198	198	198	198

All Electrical Data notes are on page 47

Table 25, ACZ BC & AGZ BM Field Wiring, Single Point

ACZ Unit Size	AGZ Unit Size	Volts	Wiring to Standard Power Block		Wiring to Optional Non-Fused Disconnect Switch	
			Terminal Amps	Connector Wire Range (Copper Wire Only)	Disconnect Size	Connector Wire Range (Copper Wire Only)
090B	**075B**	208	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		460	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		575	380	#4 – 500 kcmil	250	#6 - 350 kcmil
100B	**085B**	208	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		460	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		575	380	#4 – 500 kcmil	250	#6 - 350 kcmil
110B	**090B**	208	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		460	380	#4 – 500 kcmil	250	#6 - 350 kcmil
		575	380	#4 – 500 kcmil	250	#6 - 350 kcmil
120B	**100B**	208	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	600	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		460	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		575	380	#4 – 500 kcmil	250	#6 - 350 kcmil
130B	**110B**	208	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		460	380	#4 – 500 kcmil	400	(2) 3/0-250 kcmil
		575	380	#4 – 500 kcmil	400	(2) 3/0-250 kcmil
140B	**120B**	208	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		380	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		460	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		575	380	#4 – 500 kcmil	400	(2) 3/0-250 kcmil
155B	**130B**	208	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		230	760	2 GA – 500 kcmil	800	(2) 250 kcmil -500 kcmil
		380	760	2 GA – 500 kcmil	600	(2) 3/0-250 kcmil
		460	380	#4 – 500 kcmil	400	250 kcmil -500 kcmil
		575	380	#4 – 500 kcmil	400	(2) 3/0-250 kcmil

All Electrical Data notes are on page 47.

Table 26, ACZ BC & AGZ BM Electrical Data, Multi-Point (Up to 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Electrical Circuit #1					Electrical Circuit #2				
			Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size
				Qty	Wire Gauge				Qty	Wire Gauge		
030B	026B	208	70	3	#4	80	90	70	3	#4	80	90
		230	66	3	#4	80	90	66	3	#4	80	90
		380	42	3	#8	50	50	42	3	#8	50	50
		460	36	3	#8	45	45	36	3	#8	45	45
		575	27	3	#10	35	35	27	3	#10	35	35
035B	030B	208	70	3	#4	80	90	83	3	#4	100	110
		230	66	3	#4	80	90	83	3	#4	100	100
		380	42	3	#8	50	50	50	3	#8	60	60
		460	36	3	#8	45	45	42	3	#8	50	50
		575	27	3	#10	35	35	34	3	#10	40	45
040B	035B	208	83	3	#4	100	110	83	3	#4	100	110
		230	79	3	#4	100	100	79	3	#4	100	100
		380	50	3	#8	60	60	50	3	#8	60	60
		460	42	3	#8	50	50	42	3	#8	50	50
		575	34	3	#10	40	45	34	3	#10	40	45
045B	040B	208	88	3	#3	110	110	88	3	#3	110	110
		230	88	3	#3	110	100	88	3	#3	110	100
		380	60	3	#6	70	80	60	3	#6	70	80
		460	43	3	#8	50	50	43	3	#8	50	50
		575	37	3	#8	45	50	37	3	#8	45	50
050B	045B	208	88	3	#3	110	110	105	3	#2	125	125
		230	88	3	#3	110	110	105	3	#2	125	125
		380	60	3	#6	70	80	67	3	#4	80	80
		460	43	3	#8	50	50	55	3	#6	70	70
		575	37	3	#8	45	50	45	3	#8	50	60
055B	050B	208	105	3	#2	125	125	105	3	#2	125	125
		230	105	3	#2	125	125	105	3	#2	125	125
		380	67	3	#4	80	80	67	3	#4	80	80
		460	55	3	#6	70	70	55	3	#6	70	70
		575	45	3	#8	50	60	45	3	#8	50	60
060B	055B	208	105	3	#2	125	125	130	3	#1	150	175
		230	105	3	#2	125	125	120	3	#1	150	150
		380	67	3	#4	80	80	82	3	#3	100	110
		460	55	3	#6	70	70	59	3	#6	70	80
		575	45	3	#8	50	60	55	3	#6	70	70
065B	060B	208	130	3	#1	150	175	130	3	#1	150	175
		230	120	3	#1	150	150	120	3	#1	150	150
		380	82	3	#3	100	110	82	3	#3	100	110
		460	59	3	#6	70	80	59	3	#6	70	80
		575	55	3	#6	70	70	55	3	#6	70	70
070B	065B	208	135	3	1/0	175	175	160	3	2/0	200	225
		230	135	3	1/0	175	175	160	3	2/0	200	225
		380	82	3	#4	100	110	89	3	#3	110	125
		460	61	3	#6	70	80	69	3	#4	90	100
		575	55	3	#6	70	70	59	3	#6	70	80
080B	070B	208	160	3	2/0	200	225	160	3	2/0	200	225
		230	160	3	2/0	200	225	160	3	2/0	200	225
		380	89	3	#3	110	125	89	3	#3	110	125
		460	69	3	#4	90	100	69	3	#4	90	100
		575	59	3	#6	70	80	59	3	#6	70	80

NOTES:
1. All Electrical Data notes are on page 47.
2. Conduit hubs are not supplied.

Table 27, ACZ BC & AGZ BM Field Wiring, Multi-Point

ACZ Unit Size	AGZ Unit Size	Volts	Wiring to Standard Power Block				Wiring to Optional Non-Fused Disconnect Switch			
			Terminal Amps		Connector Wire Range (Copper Wire Only)		Disconnect Size		Connector Wire Range (Copper Wire Only)	
			Cir #1	Cir #2	Cir #1	Cir #2	Cir #1	Cir #2	Cir #1	Cir #2
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
030B	**026B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
035B	**030B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
040B	**035B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
045B	**040B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
050B	**045B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
055B	**050B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
060B	**055B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		230	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
065B	**060B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	225	225	#4 – 300 kcmil	#4 – 300 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	225	225	#4 – 300 kcmil	#4 – 300 kcmil
070B	**065B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	225	225	#4 – 300 kcmil	#4 – 300 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	225	225	#4 – 300 kcmil	#4 – 300 kcmil
080B	**070B**	380	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0

All Electrical Data notes are on page 47.

Table 28, ACZ BC & AGZ BM Field Wiring Data

ACZ Unit Size	AGZ Unit Size	Volts	Wiring to Standard Power Block				Wiring to Optional Non-Fused Disconnect Switch			
			Terminal Amps		Connector Wire Range (Copper Wire Only)		Disconnect Size		Connector Wire Range (Copper Wire Only)	
			Cir #1	Cir #2	Cir #1	Cir #2	Cir #1	Cir #2	Cir #1	Cir #2
090B	**075B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		380	175	175	14 GA – 2/0	14 GA – 2/0	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
100B	**085B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		380	175	175	14 GA – 2/0	14 GA – 2/0	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
110B	**090B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		380	175	175	14 GA – 2/0	14 GA – 2/0	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
120B	**100B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	400	#4 – 300 kcmil	250 – 500 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	400	#4 – 300 kcmil	250 - 500 kcmil
		380	175	175	14 GA – 2/0	14 GA – 2/0	150	250	#14 - 1/0	#4 – 300 kcmil
		460	175	175	14 GA – 2/0	14 GA – 2/0	150	250	#14 - 1/0	#4 – 300 kcmil
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
130B	**110B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 – 500 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 - 500kcmil
		380	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 - 300kcmil
		460	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 - 300kcmil
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
140B	**120B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 - 500 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 – 500 kcmil
		380	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		460	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0
155B	**130B**	208	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 – 500 kcmil
		230	380	380	#4 – 500 kcmil	#4 – 500 kcmil	400	400	250 – 500	250 – 500 kcmil
		380	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		460	380	380	#4 – 500 kcmil	#4 – 500 kcmil	250	250	#4 – 300 kcmil	#4 – 300 kcmil
		575	175	175	14 GA – 2/0	14 GA – 2/0	150	150	#14 - 1/0	#14 - 1/0

All Electrical Data notes are on page 47.

Table 29, ACZ BC & AGZ BM Electrical Data, Multi-Point (Up to 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Electrical Circuit #1					Electrical Circuit #2				
			Minimum Circuit Ampacity (MCA)	Power Supply Field Wire Qty	Power Supply Field Wire Wire Gauge 75C	Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire Qty	Power Supply Field Wire Wire Gauge 75C	Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size
090B	**075B**	208	188	3	3/0	225	250	188	3	3/0	225	250
		230	188	3	3/0	225	250	188	3	3/0	225	250
		380	98	3	#3	110	125	98	3	#3	110	125
		460	79	3	#4	90	110	79	3	#4	90	110
		575	66	3	#4	80	90	66	3	#4	80	90
100B	**085B**	208	188	3	3/0	225	250	218	3	4/0	250	300
		230	188	3	3/0	225	250	218	3	4/0	250	250
		380	98	3	#3	110	125	130	3	#1	150	175
		460	79	3	#4	90	110	99	3	#3	125	125
		575	66	3	#4	80	90	77	3	#4	90	100
110B	**090B**	208	218	3	4/0	250	300	218	3	4/0	250	300
		230	218	3	4/0	250	250	218	3	4/0	250	250
		380	130	3	#1	150	175	130	3	#1	150	175
		460	99	3	#3	125	125	99	3	#3	125	125
		575	77	3	#4	90	100	77	3	#4	90	100
120B	**100B**	208	203	3	4/0	250	250	273	3	300	300	300
		230	203	3	3/0	225	225	273	3	300	300	300
		380	123	3	#1	150	150	146	3	1/0	175	200
		460	92	3	#3	110	110	114	3	#1	150	175
		575	83	3	#4	100	100	94	3	#3	110	125
130B	**110B**	208	273	3	300	300	300	273	3	300	300	300
		230	273	3	300	300	300	273	3	300	300	300
		380	146	3	1/0	175	175	146	3	1/0	175	175
		460	114	3	#1	125	125	114	3	#1	125	125
		575	94	3	#3	110	110	94	3	#3	110	110
140B	**120B**	208	317	3	300	400	400	317	3	400	400	400
		230	317	3	300	400	400	318	3	400	400	400
		380	146	3	1/0	175	175	187	3	2/0	225	225
		460	114	3	#1	125	125	141	3	1/0	175	175
		575	94	3	#3	110	110	110	3	#2	125	125
155B	**130B**	208	317	3	400	400	400	317	3	400	400	400
		230	318	3	400	400	400	318	3	400	400	400
		380	187	3	2/0	225	225	187	3	2/0	225	225
		460	141	3	1/0	175	175	141	3	1/0	175	175
		575	110	3	#2	125	125	110	3	#2	125	125

NOTES:
1. All Electrical Data notes are on page 47.
2. Conduit hubs are not supplied.

Electrical Data High Ambient

Table 30, ACZ BC & AGZ BM Electrical Data, Single Point

ACZ Unit Size	AGZ Unit Size	Volts	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd. Fuse Or HACR Breaker Size	Max. Fuse Or HACR Breaker Size
				Quantity	Wire Gauge 75C		
030B	026B	208	147	3	1/0	175	175
		230	133	3	1/0	150	150
		380	80	3	#4	90	90
		460	68	3	#4	80	80
		575	53	3	#6	60	60
035B	030B	208	158	3	2/0	175	175
		230	144	3	1/0	175	175
		380	88	3	#3	100	100
		460	74	3	#4	90	90
		575	59	3	#6	70	70
040B	035B	208	168	3	2/0	200	200
		230	155	3	2/0	175	175
		380	96	3	#3	110	110
		460	80	3	#4	90	90
		575	64	3	#6	70	70
045B	040B	208	187	3	3/0	200	200
		230	167	3	2/0	200	200
		380	113	3	#2	125	125
		460	84	3	#4	90	90
		575	70	3	#4	80	80
050B	045B	208	207	3	4/0	225	225
		230	188	3	3/0	225	225
		380	123	3	#1	125	125
		460	94	3	#3	110	110
		575	78	3	#4	90	90
055B	050B	208	226	3	4/0	225	225
		230	207	3	3/0	225	225
		380	132	3	1/0	150	150
		460	104	3	#2	125	125
		575	86	3	#3	100	100
060B	055B	208	249	3	250	250	250
		230	229	3	4/0	250	250
		380	147	3	1/0	175	175
		460	115	3	#2	125	125
		575	96	3	#3	110	110
065B	060B	208	270	3	300	300	300
		230	248	3	250	250	250
		380	160	3	2/0	175	175
		460	124	3	#1	150	150
		575	105	3	#2	125	125
070B	065B	208	303	3	350	350	350
		230	282	3	300	350	350
		380	164	3	2/0	200	200
		460	138	3	1/0	175	175
		575	115	3	#2	125	125
080B	070B	208	323	3	400	400	400
		230	304	3	350	350	350
		380	172	3	2/0	200	200
		460	150	3	1/0	175	175
		575	123	3	#1	150	150

NOTES:
1. Units operating in ambient temperatures above 95°F (35°C) must use the Maximum Fuse or HACR Breaker size
2. All Electrical Data notes are on page 47.
3. Conduit hubs are not provided.

Table 31, ACZ BC & AGZ BM Compressor & Fan Motor Amps, Single & Multi-Point (106°F to 125°F)

ACZ Unit Size	AGZ Unit Size	Volts	Rated Load Amps							No. of Fan Motors	Locked Rotor Amps						
			Compressors						F.L.Amps Fan Motors (Each)		R.L.Amps Fan Motors (Each)	Compressors Across-The-Line					
			No. 1	No. 3	No. 5	No. 2	No. 4	No. 6				No.1	No. 3	No. 5	No.2	No.4	No. 6
030B	026B	208	29.0	29.0	-	29.0	29.0	-	5.8	4	23.3	189	189	-	189	189	-
		230	25.7	25.7	-	25.7	25.7	-	5.8	4	26.1	189	189	-	189	189	-
		380	14.9	14.9	-	14.9	14.9	-	4.1	4	20.0	112	112	-	112	112	-
		460	13.4	13.4	-	13.4	13.4	-	2.8	4	13.0	99	99	-	99	99	-
		575	9.5	9.5	-	9.5	9.5	-	3.0	4	14.0	74	74	-	74	74	-
035B	030B	208	29.0	29.0	-	34.0	34.0	-	5.8	4	23.3	189	189	-	232	232	-
		230	25.7	25.7	-	30.9	30.9	-	5.8	4	26.1	189	189	-	232	232	-
		380	14.9	14.9	-	18.6	18.6	-	4.1	4	20.0	112	112	-	144	144	-
		460	13.4	13.4	-	16.2	16.2	-	2.8	4	13.0	99	99	-	125	125	-
		575	9.5	9.5	-	12.2	12.2	-	3.0	4	14.0	74	74	-	100	100	-
040B	035B	208	34.0	34.0	-	34.0	34.0	-	5.8	4	23.3	232	232	-	232	232	-
		230	30.9	30.9	-	30.9	30.9	-	5.8	4	26.1	232	232	-	232	232	-
		380	18.6	18.6	-	18.6	18.6	-	4.1	4	20.0	144	144	-	144	144	-
		460	16.2	16.2	-	16.2	16.2	-	2.8	4	13.0	125	125	-	125	125	-
		575	12.2	12.2	-	12.2	12.2	-	3.0	4	14.0	100	100	-	100	100	-
045B	040B	208	38.5	38.5	-	38.5	38.5	-	5.8	4	23.3	278	278	-	278	278	-
		230	33.8	33.8	-	33.8	33.8	-	5.8	4	26.1	278	278	-	278	278	-
		380	22.8	22.8	-	22.8	22.8	-	4.1	4	20.0	151	151	-	151	151	-
		460	17.0	17.0	-	17.0	17.0	-	2.8	4	13.0	127	127	-	127	127	-
		575	13.7	13.7	-	13.7	13.7	-	3.0	4	14.0	100	100	-	100	100	-
050B	045B	208	38.5	38.5	-	47.6	47.6	-	5.8	4	23.3	278	278	-	350	350	-
		230	33.8	33.8	-	43.3	43.3	-	5.8	4	26.1	278	278	-	350	350	-
		380	22.8	22.8	-	27.2	27.2	-	4.1	4	20.0	151	151	-	195	195	-
		460	17.0	17.0	-	21.8	21.8	-	2.8	4	13.0	127	127	-	158	158	-
		575	13.7	13.7	-	17.3	17.3	-	3.0	4	14.0	100	100	-	125	125	-
055B	050B	208	47.6	47.6	-	47.6	47.6	-	5.8	4	23.3	350	350	-	350	350	-
		230	43.3	43.3	-	43.3	43.3	-	5.8	4	26.1	350	350	-	350	350	-
		380	27.2	27.2	-	27.2	27.2	-	4.1	4	20.0	195	195	-	195	195	-
		460	21.8	21.8	-	21.8	21.8	-	2.8	4	13.0	158	158	-	158	158	-
		575	17.3	17.3	-	17.3	17.3	-	3.0	4	14.0	125	125	-	125	125	-
060B	055B	208	47.6	47.6	-	58.1	58.1	-	5.8	4	23.3	350	350	-	425	425	-
		230	43.3	43.3	-	52.8	52.8	-	5.8	4	26.1	350	350	-	425	425	-
		380	27.2	27.2	-	33.8	33.8	-	4.1	4	20.0	195	195	-	239	239	-
		460	21.8	21.8	-	26.5	26.5	-	2.8	4	13.0	158	158	-	187	187	-
		575	17.3	17.3	-	21.8	21.8	-	3.0	4	14.0	125	125	-	148	148	-
065B	060B	208	58.1	58.1	-	58.1	58.1	-	5.8	4	23.3	425	425	-	425	425	-
		230	52.8	52.8	-	52.8	52.8	-	5.8	4	26.1	425	425	-	425	425	-
		380	33.8	33.8	-	33.8	33.8	-	4.1	4	20.0	239	239	-	239	239	-
		460	26.5	26.5	-	26.5	26.5	-	2.8	4	13.0	187	187	-	187	187	-
		575	21.8	21.8	-	21.8	21.8	-	3.0	4	14.0	148	148	-	148	148	-
070B	065B	208	58.1	58.1	-	58.1	78.0	-	7.8	4	31.7	425	425	-	425	505	-
		230	52.8	52.8	-	52.8	74.1	-	7.8	4	35.6	425	425	-	425	505	-
		380	32.7	32.7	-	32.7	39.8	-	4.1	4	20.0	239	239	-	239	280	-
		460	25.5	25.5		25.5	37.5	-	3.6	4	17.8	187	187	-	187	225	-
		575	21.8	21.8	-	21.8	29.9	-	3.0	4	14.0	148	148	-	148	180	-
080B	070B	208	58.1	78.0	-	58.1	78.0	-	7.8	4	31.7	425	505	-	425	505	-
		230	52.8	74.1	-	52.8	74.1	-	7.8	4	35.6	425	505	-	425	505	-
		380	32.7	39.8	-	32.7	39.8	-	4.1	4	20.0	239	280	-	239	280	-
		460	25.5	37.5	-	25.5	37.5	-	3.6	4	17.8	187	225	-	187	225	-
		575	21.8	29.9	-	21.8	29.9	-	3.0	4	14.0	148	180	-	148	180	-

All Electrical Data notes are on page 47.

Table 32, ACZ BC & AGZ BM Electrical Data, Multi-Point (106°F to 125°F)

ACZ Unit Size	AGZ Unit Size	Volts	Electrical Circuit #1					Electrical Circuit #2				
			Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size
				Qty	Wire Gauge 75C				Qty	Wire Gauge 75C		
030B	**026B**	208	77	3	#4	90	100	77	3	#4	90	100
		230	70	3	#4	80	90	70	3	#4	80	90
		380	42	3	#8	50	50	40	3	#8	50	50
		460	36	3	#8	45	45	36	3	#8	45	45
		575	27	3	#10	35	35	27	3	#10	35	35
035B	**030B**	208	77	3	#4	90	100	88	3	#3	100	110
		230	70	3	#4	80	90	81	3	#4	100	110
		380	42	3	#8	50	50	50	3	#8	60	60
		460	36	3	#8	45	45	42	3	#8	50	50
		575	27	3	#10	35	35	34	3	#10	45	45
040B	**035B**	208	88	3	#3	100	110	88	3	#3	100	110
		230	81	3	#4	100	110	81	3	#4	100	110
		380	50	3	#8	60	60	50	3	#8	60	60
		460	42	3	#8	50	50	42	3	#8	50	50
		575	34	3	#10	45	45	34	3	#10	45	45
045B	**040B**	208	98	3	#3	125	125	98	3	#3	125	125
		230	88	3	#3	110	110	88	3	#3	110	110
		380	60	3	#6	70	80	60	3	#6	70	80
		460	44	3	#8	50	60	44	3	#8	50	60
		575	37	3	#8	45	50	37	3	#8	45	50
050B	**045B**	208	98	3	#3	125	125	119	3	#1	150	150
		230	88	3	#3	110	110	109	3	#2	125	150
		380	60	3	#6	70	80	70	3	#4	80	90
		460	44	3	#8	50	60	55	3	#6	70	70
		575	37	3	#8	45	50	45	3	#8	60	60
055B	**050B**	208	119	3	#1	150	150	119	3	#1	150	150
		230	109	3	#2	125	150	109	3	#2	125	150
		380	70	3	#4	80	90	70	3	#4	80	90
		460	55	3	#6	70	70	55	3	#6	70	70
		575	45	3	#8	60	60	45	3	#8	60	60
060B	**055B**	208	119	3	#1	150	150	142	3	1/0	175	200
		230	109	3	#2	125	150	130	3	#1	175	175
		380	70	3	#4	80	90	84	3	#4	100	110
		460	55	3	#6	70	70	65	3	#4	80	90
		575	45	3	#8	60	60	55	3	#6	70	70
065B	**060B**	208	142	3	1/0	175	200	142	3	1/0	175	200
		230	130	3	#1	175	175	130	3	#1	175	175
		380	84	3	#4	100	110	84	3	#4	100	110
		460	65	3	#4	80	90	65	3	#4	80	90
		575	55	3	#6	70	70	55	3	#6	70	70
070B	**065B**	208	146	3	1/0	175	200	171	3	2/0	225	225
		230	134	3	1/0	175	175	161	3	2/0	200	225
		380	82	3	#4	100	110	91	3	#3	110	125
		460	67	3	#6	80	90	80	3	#4	100	110
		575	55	3	#6	70	70	65	3	#6	90	90
080B	**070B**	208	171	3	2/0	225	225	171	3	2/0	225	225
		230	161	3	2/0	200	225	161	3	2/0	200	225
		380	91	3	#3	110	125	91	3	#3	110	125
		460	80	3	#4	100	110	80	3	#4	100	110
		575	65	3	#6	90	90	65	3	#6	90	90

Notes:
1. All Electrical Data notes are on page 47.
2. Conduit hubs are not supplied.

Table 33, ACZ BC & AGZ BM Electrical Data, Single Point (Above 105°F)

ACZ Unit Size	AGZ Unit Size	Volts	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire		Recomm'd. Fuse Or HACR Breaker Size	Max. Fuse Or HACR Breaker Size
				Quantity	Wire Gauge 75C		
		208	378	6	250	450	450
		230	362	6	4/0	400	400
090B	**075B**	380	194	3	3/0	225	225
		460	187	3	3/0	225	225
		575	145	3	1/0	175	175
		208	398	6	250	450	450
		230	382	6	250	450	450
100B	**085B**	380	234	3	250	250	250
		460	200	3	4/0	225	225
		575	151	3	1/0	175	175
		208	416	6	300	500	500
		230	401	6	350	450	450
110B	**090B**	380	270	3	300	300	300
		460	211	3	4/0	250	250
		575	157	3	2/0	175	175
		208	522	6	400	600	600
		230	462	6	350	500	500
120B	**100B**	380	273	3	300	300	300
		460	230	3	4/0	250	250
		575	187	3	3/0	200	200
		208	612	6 - (2)	350	700	700
		230	526	6 - (2)	300	600	600
130B	**110B**	380	307	3	350	350	350
		460	263	3	300	300	300
		575	211	3	4/0	225	225
		208	612	6 - (2)	350	700	700
		230	571	6 - (2)	350	600	600
140B	**120B**	380	352	6 - (2)	4/0	400	400
		460	286	3	350	300	300
		575	219	3	4/0	250	250
		208	613	6 - (2)	350	700	700
		230	613	6 - (2)	350	700	700
155B	**130B**	380	393	6	250	450	450
		460	307	3	350	350	350
		575	228	3	250	250	250

NOTES:

1. Units operating in ambient temperatures of 95°F (35°C) and above must use the Maximum Fuse or HACR Breaker size.
2. All Electrical Data notes are on page 47.
3. (2) in column with wire qty. indicates that two conduits are required.
4. Conduit hubs are not supplied.

Table 34, ACZ BC & AGZ BM Compressor and Fan Motor Amps, Single & Multi-Point (106°F to 125°F

ACZ Unit Size	AGZ Unit Size	Volts	Rated Load Amps							No. of Fan Motors	Locked Rotor Amps						
			Compressors						F.L.Amps Fan Motors (Each)		R.L.Amps Fan Motors (Each)	Compressors Across-The-Line					
			No. 1	No. 3	No. 5	No. 2	No. 4	No. 6				No.1	No. 3	No. 5	No.2	No.4	No. 6
090B	075B	208	78.0	78.0		78.0	78.0	-	7.8	6	31.7	505	505	-	505	505	-
		230	74.1	74.1	-	74.1	74.1	-	7.8	6	35.6	505	505	-	505	505	-
		380	39.8	39.8	-	39.8	39.8	-	4.1	6	20.0	280	280	-	280	280	-
		460	38.8	38.8	-	38.8	38.8	-	3.6	6	17.8	225	225	-	225	225	-
		575	29.9	29.9	-	29.9	29.9	-	3.0	6	14.0	180	180	-	180	180	-
100B	085B	208	78.0	78.0	-	86.9	86.9	-	7.8	6	31.7	505	505	-	500	500	-
		230	74.1	74.1	-	83.3	83.3	-	7.8	6	35.6	505	505	-	500	500	-
		380	39.8	39.8	-	57.6	57.6	-	4.1	6	20.0	280	280	-	305	305	-
		460	38.8	38.8	-	44.5	44.5	-	3.6	6	17.8	225	225	-	250	250	-
		575	29.9	29.9	-	32.5	32.5	-	3.0	6	14.0	180	180	-	198	198	-
110B	090B	208	86.9	86.9	-	86.9	86.9	-	7.8	6	31.7	500	500	-	500	500	-
		230	83.3	83.3	-	83.3	83.3	-	7.8	6	35.6	500	500	-	500	500	-
		380	57.6	57.6	-	57.6	57.6	-	4.1	6	20.0	305	305	-	305	305	-
		460	44.5	44.5		44.5	44.5	-	3.6	6	17.8	250	250	-	250	250	-
		575	32.5	32.5	-	32.5	32.5	-	3.0	6	14.0	198	198	-	198	198	-
120B	100B	208	58.1	58.1	58.1	87.9	87.9	87.9	7.8	8	31.7	425	425	425	505	505	505
		230	52.8	52.8	52.8	74.2	74.2	74.2	7.8	8	35.6	425	425	425	505	505	505
		380	32.7	32.7	32.7	43.8	43.8	43.8	4.1	8	20.0	239	239	239	280	280	280
		460	25.5	25.5	25.5	37.5	37.5	37.5	3.6	8	17.8	187	187	187	225	225	225
		575	21.8	21.8	21.8	29.9	29.9	29.9	3.0	8	14.0	148	148	148	180	180	180
130B	110B	208	87.9	87.9	87.9	87.9	87.9	87.9	7.8	8	31.7	505	505	505	505	505	505
		230	74.2	74.2	74.2	74.2	74.2	74.2	7.8	8	35.6	505	505	505	505	505	505
		380	43.8	43.8	43.8	43.8	43.8	43.8	4.1	8	20.0	280	280	280	280	280	280
		460	37.5	37.5	37.5	37.5	37.5	37.5	3.6	8	17.8	225	225	225	225	225	225
		575	29.9	29.9	29.9	29.9	29.9	29.9	3.0	8	14.0	180	180	180	180	180	180
140B	120B	208	87.9	87.9	87.9	88.0	88.0	88.0	7.8	8	31.7	505	505	505	500	500	500
		230	74.2	74.2	74.2	88.0	88.0	88.0	7.8	8	35.6	505	505	505	500	500	500
		380	43.8	43.8	43.8	57.6	57.6	57.6	4.1	8	20.0	280	280	280	305	305	305
		460	37.5	37.5	37.5	44.5	44.5	44.5	3.6	8	17.8	225	225	225	250	250	250
		575	29.9	29.9	29.9	32.5	32.5	32.5	3.0	8	14.0	180	180	180	198	198	198
155B	130B	208	88.0	88.0	88.0	88.0	88.0	88.0	7.8	8	31.7	500	500	500	500	500	500
		230	88.0	88.0	88.0	88.0	88.0	88.0	7.8	8	35.6	500	500	500	500	500	500
		380	57.6	57.6	57.6	57.6	57.6	57.6	4.1	8	20.0	305	305	305	305	305	305
		460	44.5	44.5	44.5	44.5	44.5	44.5	3.6	8	17.8	250	250	250	250	250	250
		575	32.5	32.5	32.5	32.5	32.5	32.5	3.0	8	14.0	198	198	198	198	198	198

All Electrical Data notes are on page 47.

Table 35, ACZ BC & AGZ BM Electrical Data, Multi-Point (106°F)

ACZ Unit Size	AGZ Unit Size	Volts	Electrical Circuit #1					Electrical Circuit #2				
			Minimum Circuit Ampacity (MCA)	Power Supply Field Wire Qty	Power Supply Field Wire Wire Gauge 75C	Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size	Minimum Circuit Ampacity (MCA)	Power Supply Field Wire Qty	Power Supply Field Wire Wire Gauge 75C	Recomm'd Fuse or HACR Breaker Size	Max. Fuse or HACR Breaker Size
090B	**075B**	208	199	3	3/0	225	250	199	3	3/0	225	250
		230	190	3	3/0	225	250	190	3	3/0	225	250
		380	102	3	#2	125	125	102	3	#2	125	125
		460	99	3	#3	110	125	99	3	#3	110	125
		575	76	3	#4	90	100	76	3	#4	90	100
100B	**085B**	208	199	3	3/0	225	250	219	3	4/0	250	300
		230	190	3	3/0	225	250	211	3	4/0	250	250
		380	102	3	#2	125	125	142	3	1/0	175	175
		460	99	3	#3	110	125	111	3	#2	125	150
		575	76	3	#4	90	100	83	3	#3	100	110
110B	**090B**	208	219	3	4/0	250	300	219	3	4/0	250	300
		230	211	3	4/0	250	250	211	3	4/0	250	250
		380	142	3	1/0	175	175	142	3	1/0	175	175
		460	111	3	#2	125	150	111	3	#2	125	150
		575	83	3	#3	100	110	83	3	#3	100	110
120B	**100B**	208	220	3	4/0	250	250	317	3	400	350	400
		230	203	3	4/0	225	250	272	3	300	300	300
		380	123	3	#1	150	150	159	3	2/0	175	200
		460	101	3	#2	110	125	136	3	1/0	150	175
		575	83	3	#4	100	100	109	3	#2	125	125
130B	**110B**	208	317	3	400	350	400	317	3	400	350	400
		230	272	3	300	300	300	272	3	300	300	300
		380	159	3	2/0	175	200	159	3	2/0	175	200
		460	136	3	1/0	150	175	136	3	1/0	150	175
		575	109	3	#2	125	125	109	3	#2	125	125
140B	**120B**	208	317	3	400	400	400	317	3	400	400	400
		230	272	3	300	300	300	317	3	400	400	400
		380	159	3	2/0	200	200	204	3	4/0	250	250
		460	136	3	1/0	175	175	159	3	2/0	200	200
		575	109	3	#2	125	125	118	3	#1	150	150
155B	**130B**	208	317	3	400	400	400	317	3	400	400	400
		230	317	3	400	400	400	317	3	400	400	400
		380	204	3	4/0	250	250	204	3	4/0	250	250
		460	159	3	2/0	200	200	159	3	2/0	200	200
		575	118	3	#1	150	150	118	3	#1	150	150

NOTES:
1. All Electrical Data notes are on page 47.
2. Conduit hubs are not supplied.

Notes for "Electrical Data Single- and Multi-Point" Power:

1. Unit wire size ampacity (MCA) is equal to 125% of the largest compressor-motor RLA plus 100% of RLA of all other loads in the circuit including the control transformer.
2. The control transformer is furnished on the unit and no separate 115V power is required. For both single- and multi-point power connections, the control transformer is in circuit #1 with control power wired from there to circuit #2. In multi-point power, disconnecting power to circuit will disconnect all control power to the unit.
3. If a separate 115V power supply is used for the control circuit, then the wire sizing amps is 10 amps for all unit sizes.
4. Recommended power lead wire sizes for 3 conductors per conduit are based on 100% conductor ampacity in accordance with NEC. Voltage drop has not been included. Therefore, it is recommended that power leads be kept short. All terminal block connections must be made with copper (type THW) wire.
5. "Recommended Fuse Sizes" are selected at approximately 150% to 175% of the largest compressor RLA, plus 100% of all other loads in the circuit.
6. "Maximum Fuse or HACR breaker size" is selected at approximately 225% of the largest compressor RLA, plus 100% of all other loads in the circuit.
7. The recommended power lead wire sizes are based on an ambient temperature of 86°F (30°C). Ampacity correction factors must be applied for other ambient temperatures. Refer to the National Electrical Code Handbook.
8. Must be electrically grounded according to national and local electrical codes.

Voltage Limitations:

Within ± 10 percent of nameplate rating.

Notes for "Compressor and Condenser Fan Amp Draw":

1. Compressor RLA values are for wiring sizing purposes only but do not reflect normal operating current draw at rated capacity.

Notes for "Field Wiring Data"

1. Requires a single disconnect to supply electrical power to the unit. This power supply must either be fused or use an HACR type circuit breaker.
2. All field wiring to unit power block or optional non-fused disconnect switch must be copper.
3. All field wire size values given in table apply to 75°C rated wire per NEC.

Circuit Breakers

Factory installed circuit breakers are standard on units with single point power supply only. This option provides unit installed compressor short circuit protection and makes servicing easier.

Connection Type	Power Block	Disconnect Swt.	Circuit Breakers	High Short Circuit Current
Single Point (Standard)	Std	Opt.	Std	Opt
Multi-Point (Optional)	Std	Opt.	Not Avail.	Opt.

Figure 24, AGZ-BM, Typical Field Wiring Diagram

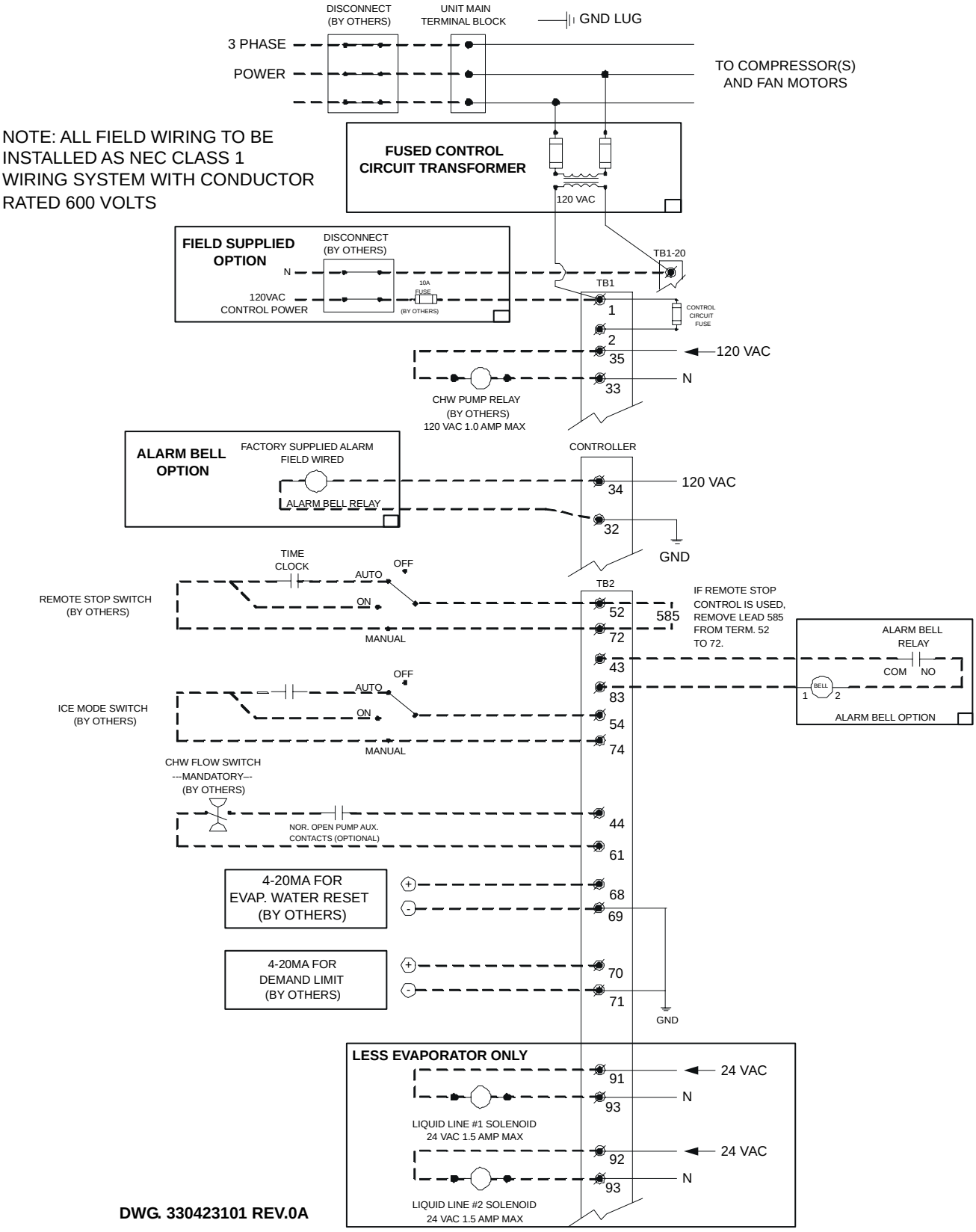
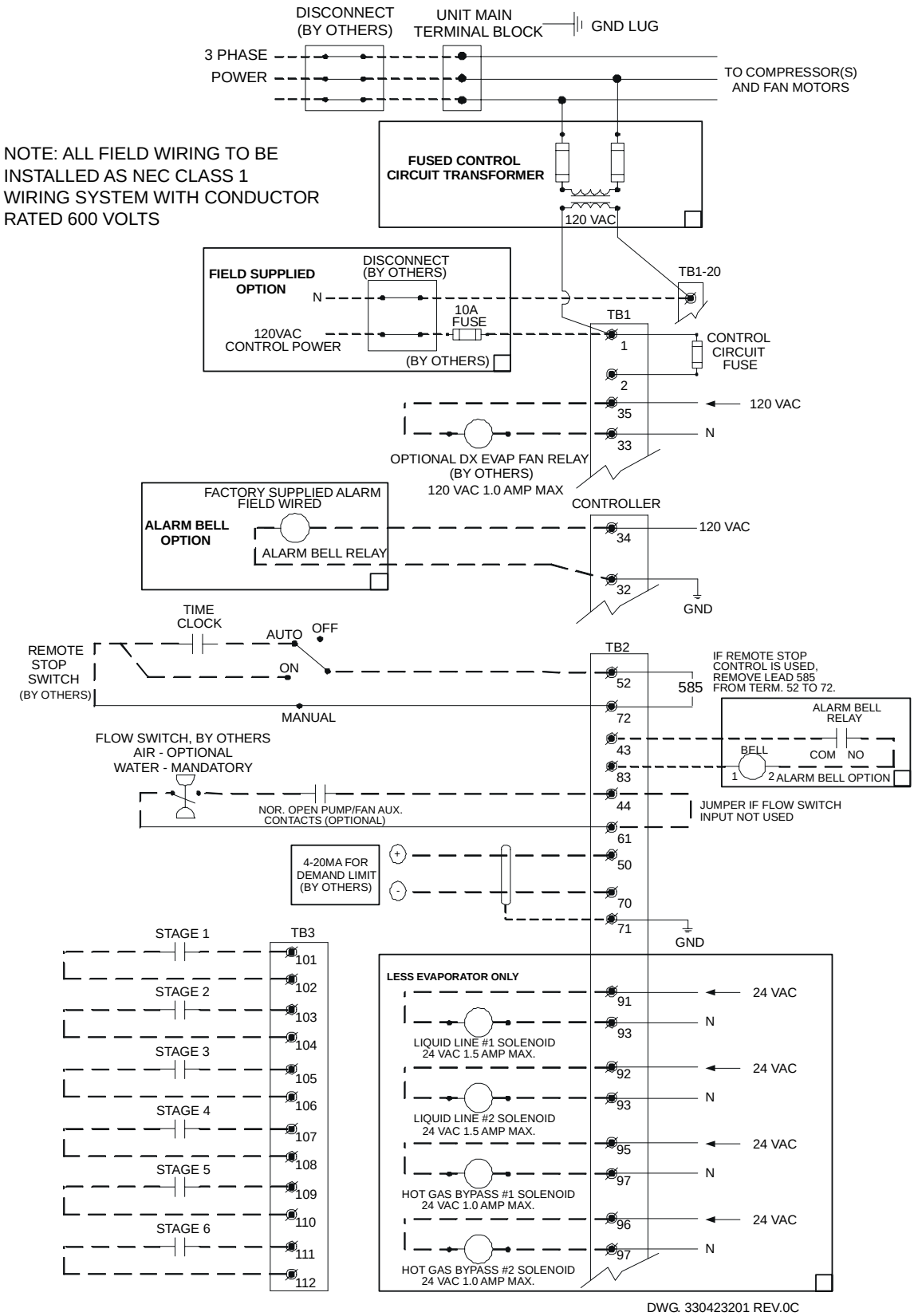
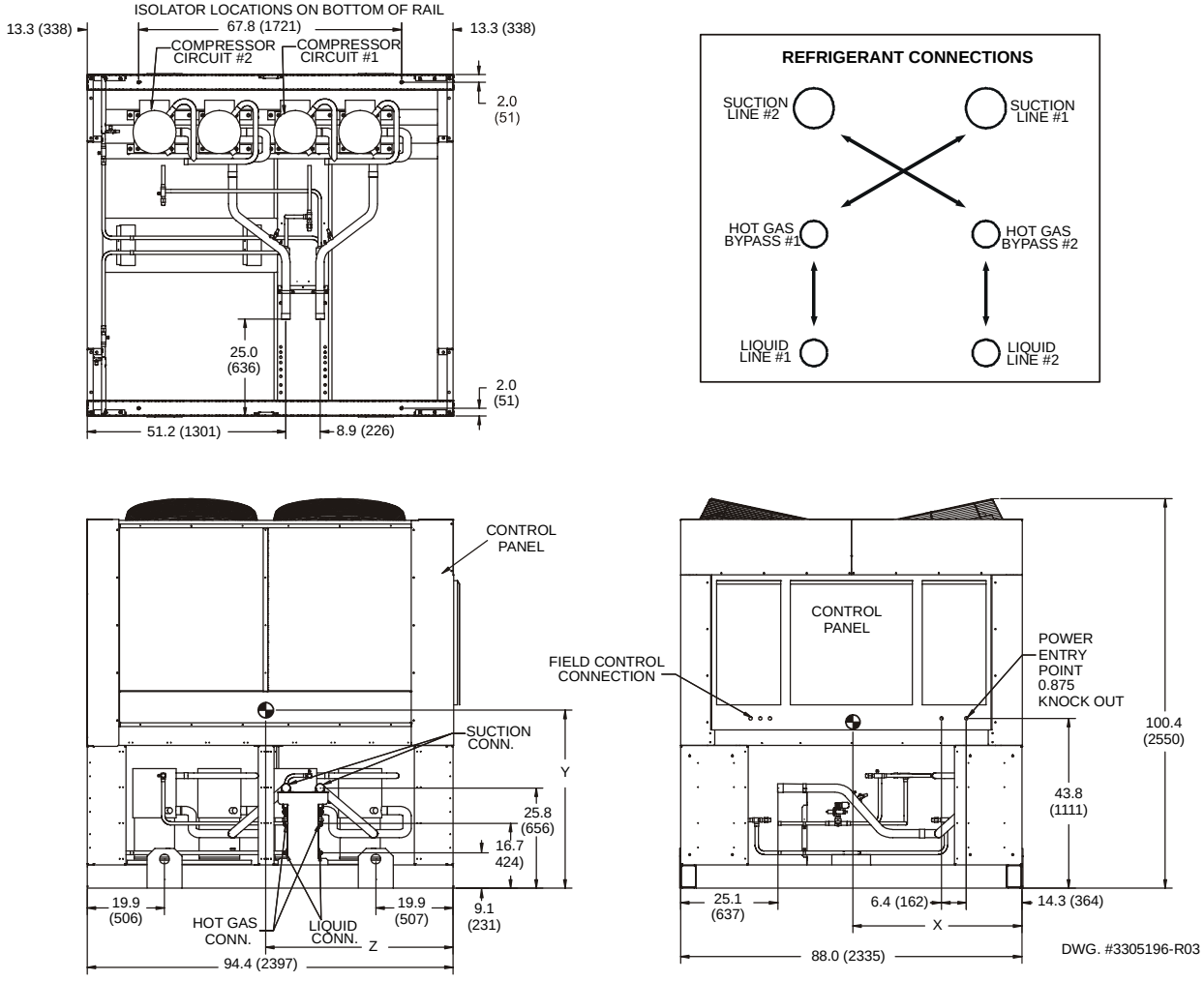


Figure 25, ACZ-B, Typical Field Wiring Diagram



Dimensional Data

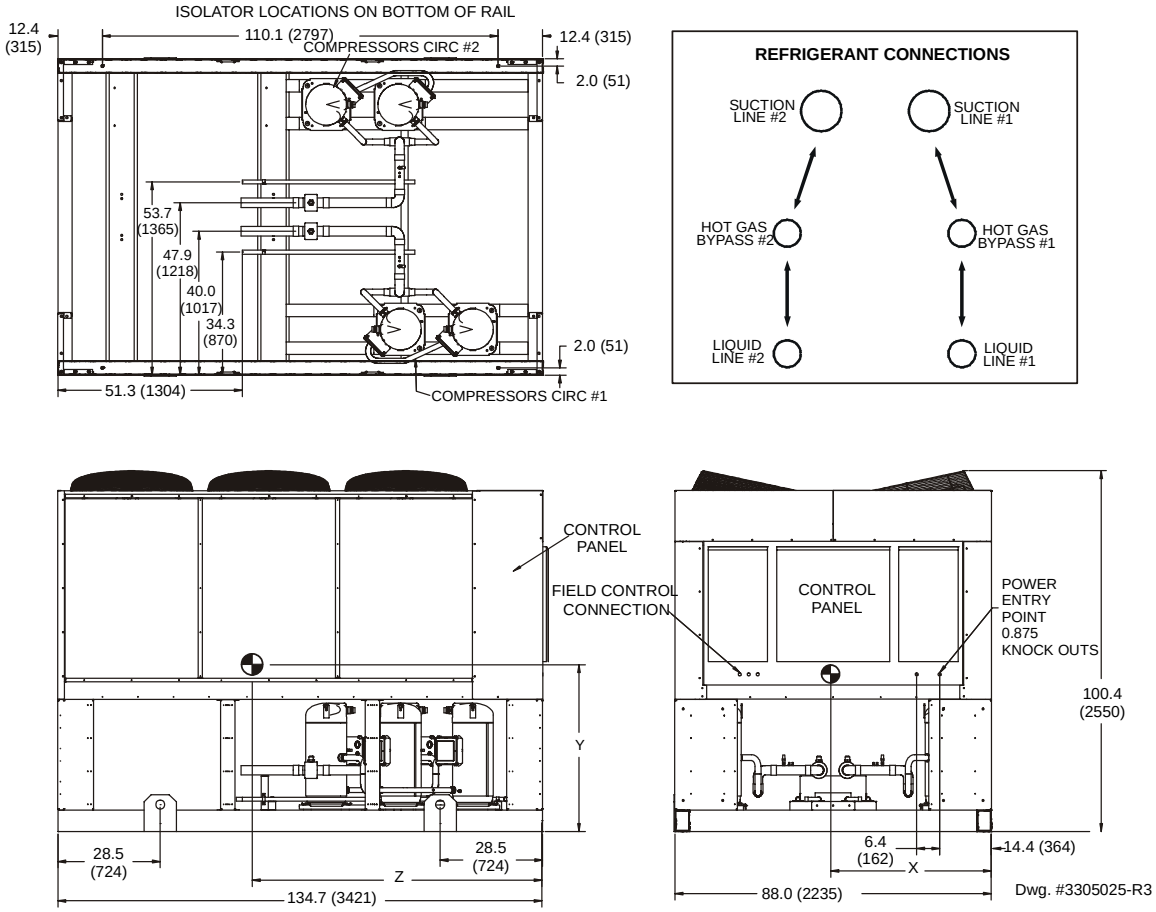
Figure 26, Dimensions: ACZ 030B - 080B
AGZ 026BM – 070BM



NOTES:
1. Hail and wind guards add 20 inches to the width of each side.
2. Be sure that the expansion valves' sensing bulb and capillary are attached to the correct suction line.

ACZ-B Unit Size	AGZ-BM Unit Size	Liquid Conn.	Suction Conn.	Center of Gravity in. (mm)			Weights lbs. (kg)	
				X	Y	Z	Shipping	Operating
030B	**026BM**	(2) 1 3/8	(2) 2 1/8	36 (914)	42 (1067)	42 (1067)	3550 (1610)	3600 (1633)
035B	**030BM**	(2) 1 3/8	(2) 2 1/8	36 (914)	42 (1067)	42 (1067)	3550 (1610)	3600 (1633)
040B	**035BM**	(2) 1 3/8	(2) 2 1/8	36 (914)	42 (1067)	42 (1067)	3550 (1610)	3600 (1633)
045B	**040BM**	(2) 1 3/8	(2) 2 1/8	36 (914)	41 (1041)	41 (1041)	3550 (1610)	3610 (1637)
050B	**045BM**	(2) 1 3/8	(2) 2 1/8	36 (914)	41 (1041)	41 (1041)	3590 (1628)	3650 (1656)
055B	**050BM**	(2) 1 3/8	(2) 2 5/8	36 (914)	42 (1067)	42 (1067)	3730 (1692)	3800 (1724)
060B	**055BM**	(2) 1 3/8	(2) 2 5/8	35 (889)	42 (1067)	43 (1092)	3780 (1715)	3850 (1746)
065B	**060BM**	(2) 1 3/8	(2) 2 5/8	35 (889)	42 (1067)	43 (1092)	3820 (1733)	4040 (1833)
070B	**065BM**	(2) 1 3/8	(2) 2 5/8	35 (889)	43 (1092)	45 (1143)	3970 (1801)	4070 (1846)
080B	**070BM**	(2) 1 3/8	(2) 2 5/8	36 (914)	44 (1118)	46 (1168)	4080 (1851)	4180 (1896)

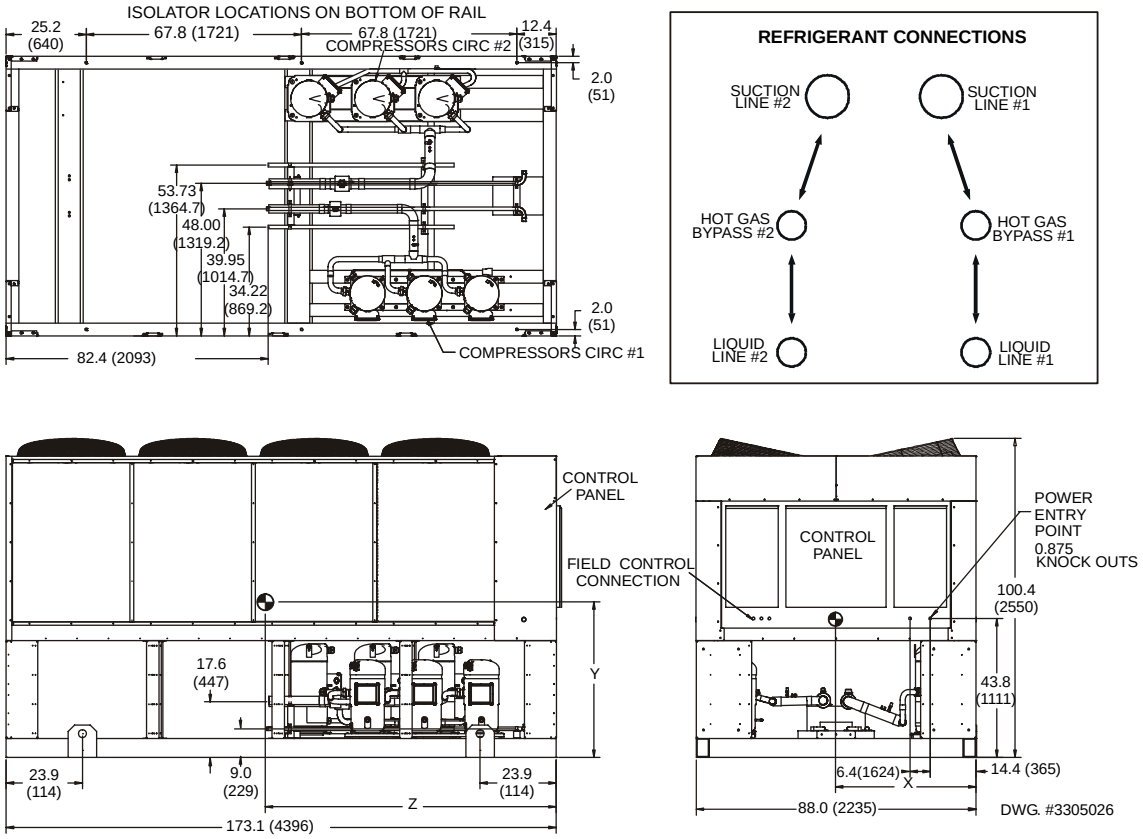
Figure 27, Dimensions: ACZ 090B - 110B
AGZ 075BM – 090BM



NOTES:
1. Hail and wind guards add 20 inches to the width of each side.
2. Be sure that the expansion valves' sensing bulb and capillary are attached to the correct suction line.

ACZ-B Unit Size	AGZ-BM Unit Size	Liquid Conn.	Suction Conn.	Center of Gravity Inches (mm)			Weights Lbs. (kg)	
				X	Y	Z	Shipping Weight	Operating Weight
090B	**075BM**	(2) 1 3/8	(2) 3 1/8	44 (1118)	46 (1168)	58 (1473)	5510 (2499)	5630 (2554)
100B	**085BM**	(2) 1 3/8	(2) 3 1/8	43 (1092)	44 (1118)	58 (1473)	5670 (2572)	5790 (2626)
110B	**090BM**	(2) 1 3/8	(2) 3 1/8	44 (1118)	41 (1041)	57 (1448)	5830 (5830)	5950 (2699)

Figure 28, Dimensions: ACZ 120B - 155B
AGZ 100BM – 130BM

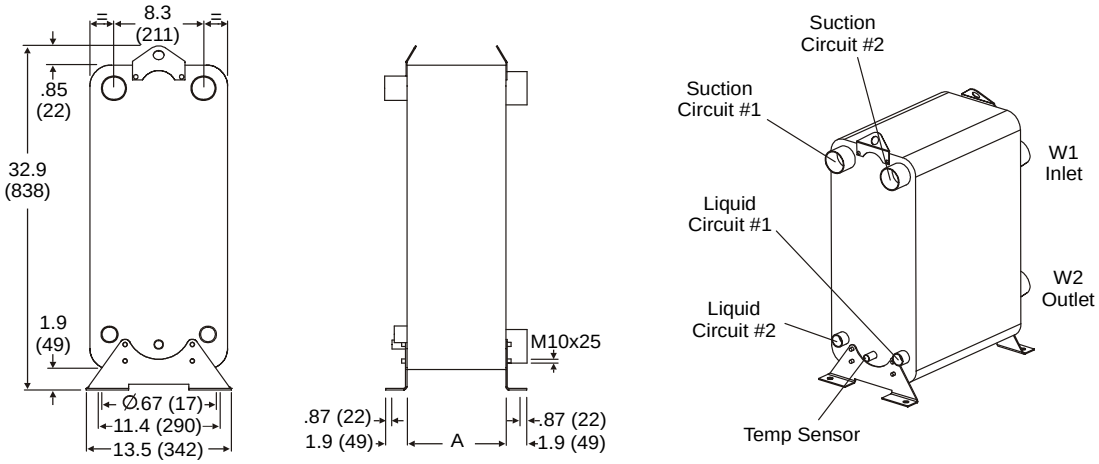


NOTES:
1. Hail and wind guards add 20 inches to the width of each side.
2. Be sure that the expansion valves' sensing bulb and capillary are attached to the correct suction line.

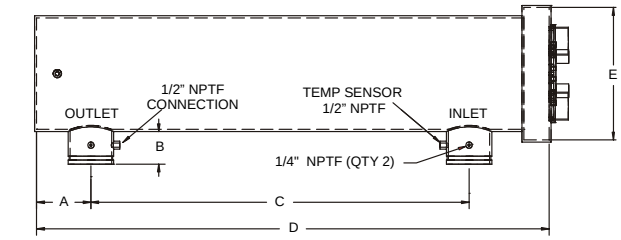
ACZ-B Unit Size	AGZ-BM Unit Size	Liquid Conn.	Suction Conn.	Center of Gravity Inches (mm)			Weights Lbs. (kg)	
				X	Y	Z	Shipping Weight	Operating Weight
120B	**100BM**	(2) 1 3/8	(2) 3 1/8	43 (1092)	46 (1168)	75 (1905)	6820 (3094)	6970 (3162)
130B	**110BM**	(2) 1 3/8	(2) 3 1/8	44 (1118)	46 (1168)	73 (1854)	7080 (3211)	7230 (3280)
140B	**120BM**	(2) 1 3/8	(2) 3 1/8	43 (1092)	63 (1600)	73 (1854)	7360 (3338)	7480 (3393)
155B	**130BM**	(2) 1 3/8	(2) 3 1/8	44 (1118)	40 (1016)	71 (1803)	7640 (3466)	7760 (3520)

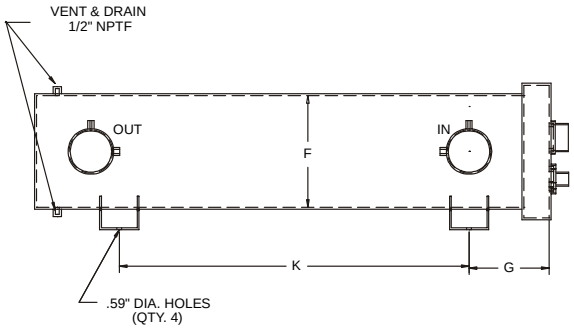
Remote Evaporators

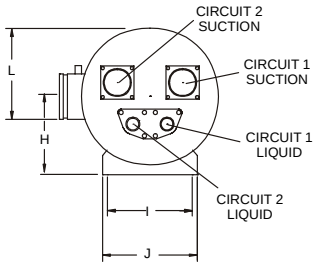
Figure 29, Remote Evaporators, AGZ 026BM – 130BM



AGZ Model	Liquid Line Conn. Brazed, in	Suction Line Conn. Brazed, in (S).	Temp. Sensor NPT, in. (TS)	Victaulic Water Conn. In. (W)	Dimension "A" in. (mm)
026	1.375	2.125	0.75	3.0	8.3 (210)
030	1.375	2.125	0.75	3.0	8.3 (210)
035	1.375	2.125	0.75	3.0	9.2 (233)
040	1.375	2.125	0.75	3.0	10.5 (267)
045	1.375	2.125	0.75	3.0	11.8 (300)
050	1.375	2.125	0.75	3.0	13.1 (336)
055	1.375	2.125	0.75	3.0	15.0 (380)
060	1.375	2.625	0.75	3.0	16.7 (425)
065	1.375	2.625	0.75	3.0	19.0 (481)
070	1.375	2.625	0.75	3.0	19.0 (481)







AGZ Model	A	B	C	D	E	F	G	H	I	J	K	L	W (Water)	S (Suction)	L (Liquid)
075	6.6	3.9	52.2	61.9	16.0	13.5	9.7	9.5	10.2	11.4	42.2	17.7	(2) 5.0	(2) 3.125	(2) 1.375
085	6.6	3.9	52.2	61.9	16.0	13.5	9.7	9.5	10.2	11.4	42.2	17.7	(2) 5.0	(2) 3.125	(2) 1.375
090	6.6	3.9	52.2	61.9	16.0	13.5	9.7	9.5	10.2	11.4	42.2	17.7	(2) 5.0	(2) 3.125	(2) 1.375
100	6.4	3.9	85.2	94.6	15.3	12.8	11.0	10.2	12.6	13.8	72.1	17.8	(2) 5.0	(2) 3.125	(2) 1.375
110	6.4	3.9	85.2	94.6	15.3	12.8	11.0	10.2	12.6	13.8	72.1	17.8	(2) 5.0	(2) 3.125	(2) 1.375
120	6.8	4.0	84.0	95.5	16.5	14.0	11.9	10.2	12.6	13.8	72.1	18.4	(2) 8.0	(2) 3.125	(2) 1.375
130	6.8	4.0	84.0	95.5	16.5	14.0	11.9	10.2	12.6	13.8	72.1	18.4	(2) 8.0	(2) 3.125	(2) 1.375

NOTE: Water connections are victaulic sized in inches. Refrigerant connections are IDS sized in inches.

Optional Features

Any of the following options can be included on a unit:

Controls

Hot Gas Bypass

Hot gas bypass permits unit operation down to 10% of full load capacity. This option includes a factory-mounted hot gas bypass valve, solenoid valve, and manual shutoff valve for each circuit.

Head Pressure Control

Fan VFD low ambient control allows unit operation down to 0°F (-18°C). (Not available on 380 volt, 60 Hertz units.)

Water Flow Switch (AGZ-BM only)

(P/N 017503300) A water flow switch is available for field installation in the chilled water piping to avoid evaporator freeze-up under low or no flow conditions. Terminals are provided in the unit control center for field hook-up of the water flow switch. If this option is not ordered with the unit, then a field supplied water flow switch must be installed.

Alarm Bell

Field-installed and wired to the control panel to provide remote indication of unit alarm condition. See Field Wiring Diagram for connection locations.

BAS Interface (Protocol Selectability™ Feature)

Connection to Chiller

Connection to the chiller for all Building Automation System (BAS) protocols will be at the unit controller. An interface card, depending on the protocol being used, can be factory-installed in the unit controller (or it can be field-installed).

Protocols Supported

Table 36, Standard Protocol Data

Protocol	Physical Layer	Data Rate	Controller	Other
BACnet®/IP or BACnet/Ethernet	Ethernet 10 Base-T	10 Megabits/sec	pCO^2 Unit Controller	Reference ED 15057: BACnet PICS
BACnet MSTP	RS-485	(TBD)	pCO^2 Unit Controller	Reference ED 15057: BACnet PICS
LONWORKS®	FTT-10A	78kbits/sec	pCO^2 Unit Controller	LONMARK® Chiller Functional Profile
Modbus RTU?	RS-485or RS-232	(TBD)	pCO^2 Unit Controller	

Note: For additional information on the protocol data available through the BACnet or LONWORKS communications modules reference ED 15062, *MicroTech II Chiller Unit Controller Protocol Information.*

Modbus – When selected, the ident number and baud rate can also be changed to suit the application.

LONWORKS – When selected, the ident number and baud rate setpoints are not available. Baud rate is locked at 4800.

BACnet – When selected, the ident number and baud rate setpoints are not available. Baud rate is locked at 19200.

The interface kits on the MicroTech II™ controller are as follows:

- BACnet Kit P/N 350147404: BACnet/IP, BACnet MS/TP, or BACnet Ethernet
- LONWORKS Kit P/N 350147401: LonTalk (FTT-10A)
- Modbus RTU

The following functions are available through the BAS where possible. Exact capabilities can vary depending on the protocol in use.

- Enable/Disable chiller operation by setting the Unit Enable setpoint.
- Select the operating mode by setting the Unit Mode setpoint.
- Set the Cool LWT and Ice LWT setpoints.
- Read all digital and analog I/O values.
- Read Enable status of chiller.
- Read current operating mode and status (state) of chiller.
- Send a description of each alarm when it occurs.

Reference documents ED 15057, ED 15062 and ED 15063 can be obtained from the local McQuay sales office, or they can also be found on www.mcquay.com under Product Information > (chiller type) > Control Integration.

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Unit

Vibration Isolators

Spring or neoprene-in-shear vibration isolators are available for field installation to reduce vibration transmission through the unit base. See page 12 for detailed information on their installation.

Protective Base Guards

Optional factory installed vinyl-coated welded wire base guards provide all-around lower unit protection on ground level installations. Coil guards are standard.

Copper Fin Condenser Coils

Copper fin condenser coils are available as an option on all models.

Black Fin Coils

Aluminum fin stock precoated with a phenolic coating with 1000 hour salt spray resistance (ASTM B117-90).

Coated Fins

Copper or aluminum fins coated with *ElectroFin*® baked epoxy protective coating with 3000+ hour salt spray resistance (ASTM B117-90).

Evaporator Insulation (AGZ-BM only)

Double insulation thickness (total of 1 ½ inch) for high humidity areas or low fluid temperatures.

Sound Reduction

Acoustical blankets are factory-installed on each compressor.

Hail and Wind Guards

A field-mounted option shipped as a kit including panels, fasteners, and instructions. See page 24 for further information.

Refrigerant Specialties Kit

Required on AGZ-BM Remote Evaporator units consisting of thermal expansion valve, solenoid valve, sight glass and filter-drier (sealed on Models 026 to 070, replaceable core on Models 075 to 130).

Electrical

Multi-Point Electrical Connection

Provides a power connection to each of the unit's two electrical circuits.

Disconnect Switch with Through-the-Door Handle

A factory or field-installed option for service use, nonfused disconnect switch (mounted inside the power section of the control box) with a through-the-door handle is available with single and multi-point power supply.

Phase Loss/Voltage Protection

Phase loss with under/over voltage protection and multiple LED indication of fault type is available as a factory-installed option to guard against compressor motor burnout.

Convenience Outlet

10.0 amp, 115 volt outlet located in control panel to provide power for servicing unit.

Ground Fault Protection

Protects equipment from damage from line-to-ground fault currents less than those required for conductor protection.

High Short Circuit Current Protection

Provides control panel protection against short circuit currents per following table:

Voltage	208	240	460	600
Current (kA)	120	100	65	25

High Ambient Control Panel

Consists of exhaust fan with rain hood, two inlet screens with filters, necessary controls and wiring to allow operation to 125°F. The option can be factory or field-installed as a kit. Must be used for:

- Ambient temperatures above 105°F (40°C) with fan VFD (low ambient option)
- Ambient temperatures above 115°F (46°C) with standard FanTrol control.

AGZ MicroTech II™ Controller

Software Version AGZD20101A

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Overview

MicroTech II controller's state-of-the-art design not only permits the chiller to run more efficiently, but also simplifies troubleshooting if a system failure occurs. Every MicroTech II controller is programmed and tested prior to shipment to facilitate start-up.

The AGZ-AM controller software is identical to the software used in the AGZ-AS packaged chiller. Some field wiring is required between the remote evaporator and the outdoor unit.

Operator-friendly

The MicroTech II controller menu structure is separated into three distinct categories that provide the operator or service technician with a full description of current unit status, control parameters, and alarms. Security protection prevents unauthorized changing of the setpoints and control parameters.

The MicroTech II control continuously performs self-diagnostic checks, monitoring system temperatures, pressures and protection devices, and will automatically shut down a compressor or the entire unit should a fault occur. The cause of the shutdown will be retained in memory and can be easily displayed in plain English for operator review. The MicroTech II chiller controller will also retain and display that the date/time the fault occurred. In addition to displaying alarm diagnostics, the MicroTech II chiller controller also provides the operator with a warning of limit (pre-alarm) conditions.

AGZ-B Inputs/Outputs

Table 37, Analog Inputs

No.	Description	Type	Signal Source	Range
1	Evaporator Refrigerant Pressure #1	C1	0.1 to 0.9 VDC	0 to 132 psi
2	Evaporator Refrigerant Pressure #2	C2	0.1 to 0.9 VDC	0 to 132 psi
3	Condenser Refrigerant Pressure #1	C1	0.1 to 0.9 VDC	3.6 to 410 psi
4	Leaving Evaporator Water Temperature	UT	NTC Thermister (10k@25°C)	-58 to 212°F
5	Outside Ambient Temperature	UT	NTC Thermister (10k@25°C)	-58 to 212°F
6	Condenser Refrigerant Pressure #2	C2	0.1 to 0.9 VDC	3.6 to 410 psi
7	Reset of Leaving Water Temperature	UT	4-20 mA Current	0-(10 to 80°F)
8	Demand Limit	UT	4-20 mA Current	0-100 % Load
9	Compressor Suction Temperature #1	C1	NTC Thermister (10k@25°C)	-58 to 212°F
10	Compressor Suction Temperature #2	C2	NTC Thermister (10k@25°C)	-58 to 212°F

NOTE: C1 = Refrigerant Circuit #1, C2 = Refrigerant Circuit #2, UT = Unit

Table 38, Analog Outputs

No.	Description	Output Signal	Range
1	Fan #1 VFD	0 to 10 VDC	20 to 60 Hz
2	Fan #2 VFD	0 to 10 VDC	20 to 60 Hz

Table 39, Digital Inputs

#	Description	Type	Signal	Signal
1	Unit OFF Switch	UT	0 VAC (Disable)	24 VAC (Enable)
2	Pump Down Switch #1	C1	0 VAC (Disable)	24 VAC (Enable)
3	Evaporator Water Flow Switch	UT	0 VAC (No Flow)	24 VAC (Flow)
4	Open			
5	Open			
6	Pump Down Switch #2	C2	0 VAC (Disable)	24 VAC (Enable)
7	Open			
8	Open			
9	Phase Voltage Fault #1 (See Note 1)	C1	0 VAC (Fault)	24 VAC (No Fault)
10	Phase Voltage Fault #2 (See Note 1)	C2	0 VAC (Fault)	24 VAC (No Fault)
11	Ground Fault Prot. #1 (See Note 2 Below)	C1	0 VAC (Fault)	24 VAC (No Fault)
12	Ground Fault Prot. #2 (See Note 2 Below)	C2	0 VAC (Fault)	24 VAC (No Fault)
13	Remote Start/Stop	UT	0 VAC (Disable)	24 VAC (Enable)
14	Open			
15	Mechanical High Pressure/Motor Protect Circuit 1	C2	0 VAC (Fault)	24 VAC (No Fault)
16	Mechanical High Pressure/Motor Protect Circuit 2	C2	0 VAC (Fault)	24 VAC (No Fault)
17	Ice Mode Switch	UT	0 VAC (Cool)	24 VAC (Ice)
18	Open			

NOTES:

1. C1 = Refrigerant Circuit #1, C2 = Refrigerant Circuit #2, UT = Unit
2. See Safety Alarms Table for "Phase Voltage Protection". Units with single point electrical connection will have one PVM with Inputs 9 and 10 wired together. Units with multiple point connection will have two PVM's with Input 9 for Electrical Circuit #1 and Input 10 for Electrical Circuit #2.
3. See Safety Alarms Table for "Ground Fault Protection". Units with single point electrical connection will have one GFP with Inputs 11 and 12 wired together. Units with multiple point connection will have two GFP's with Input 11 for Electrical Circuit #1 and Input 12 for Electrical Circuit #2.

Table 40, Digital Outputs

No.	Description	Type	Load	Output OFF	Output ON
1	Alarm	C1,C2,UT	Alarm Indicator	Alarm OFF	Alarm ON
2	Evaporator Water Pump	UT	Pump Contactor	Pump OFF	Pump ON
3	Motor Control Relay #1 = Compr#1	C1	Starter	Compressor OFF	Compressor ON
4	Motor Control Relay #2 = Compr#2	C2	Starter	Compressor OFF	Compressor ON
5	Motor Control Relay #3 = Compr#3	C1	Starter	Compressor OFF	Compressor ON
6	Motor Control Relay #4 = Compr#4	C2	Starter	Compressor OFF	Compressor ON
7	Liquid Line #1	C1	Solenoid	Cooling OFF	Cooling ON
8	Motor Control Relay #5 = Compr#5	C1	Starter	Compressor OFF	Compressor ON
9	Motor Control Relay #6 = Compr#6	C2	Starter	Compressor OFF	Compressor ON
10	Condenser Fan #1	C1	Fan Contactor	Fan OFF	Fan ON
11	Condenser Fan #2	C2	Fan Contactor	Fan OFF	Fan ON
12	Liquid Line #2	C2	Solenoid	Cooling OFF	Cooling ON
13	Condenser Fan #3	C1	Fan Contactor	Fan OFF	Fan ON
14	Hot Gas Bypass #1	C1	Solenoid	Cooling OFF	Cooling ON
15	Hot Gas Bypass #2	C2	Solenoid	Cooling OFF	Cooling ON
16	Condenser Fan #4	C2	Fan Contactor	Fan OFF	Fan ON
17	Condenser Fan #5 (&#7 on 8 Fans Only)	C1	Fan Contactor	Fan OFF	Fan ON
18	Condenser Fan #6 (&#8 on 8 Fans Only)	C2	Fan Contactor	Fan OFF	Fan ON

Setpoints

The setpoints shown in Table 41 are battery-backed and remembered during power off, are factory set to the **Default** value, and can be adjusted within the values shown in **Range**.

The PW (password) column indicates the password. Passwords are as follows:
O = Operator =0100
M = Manager=2001

Table 41, Setpoints

Description	Default	Range	PW
Unit Enable	OFF	OFF, ON	O
Unit Mode	COOL	COOL, COOL w/Glycol, ICE w/Glycol, TEST	O
Control source	DIGITAL INPUT	KEYPAD, BAS, DIGITAL INPUT	O
Available Modes	COOL	COOL, COOL w/GLYCOL, COOL/ICE w/GLYCOL, ICE w/GLYCOL. TEST	M
Display Units			**
Language			**
Protocol	Modbus	BACnet, LonWorks, MODBUS	M
Ident number (Modbus only)	001	001-999	M
Baud rate (Modbus only)	9600	1200,2400,4800,9600,19200	M
Cool LWT	44. 0°F	20.0(40.0) to 60.0 °F	O
Ice LWT	40. 0°F	20.0 to 40.0 °F	O
Evap Delta T	10. 0°F	6.0 to 16.0 °F	O
Startup Delta T	5.0°F	1.0 to 10.0 °F	O
Stop Delta T	0.5°F	0.5 to 3.0°F	O
Max Pulldown Rate	1.0°F	0.5 to 5.0 °F	M
Evap Recirculate Timer	30	15 to 300 sec	M
Low Ambient Lockout	35 °F	–2(35) to 60 °F	M
Demand Limit	No	No,Yes	M
* Multipoint Power	No	No,Yes	M
Compressor			
* Number of Compressors	4	4,6	M
Stage Up Delay	120	90 to 240 sec	M
Stage Down Delay	30	20 to 60 sec	M
Start-Start	15 min	10 to 60 min	M
Stop-Start	5 min	3 to 20 min	M
Clear Cycle Timers	No	No,Yes	M
Alarms			
Low Evap Pressure-Hold	59 psi	31 to 65 psi	M
Low Evap Pressure-Unload	59 psi	31 to 65 psi	M
High Condenser Stage Down	370 psi	365 to 380 psi	M
High Condenser Pressure	385 psi	385 to 390 psi	M
Evaporator Water Freeze	38.0 °F	18(37) to 42 °F	M
* Phase Voltage Protection	No	No,Yes	M
* Ground Fault Protection	No	No,Yes	M
Evap Flow Proof	5 sec	3 to 30 sec	M
Condenser Fans			
VFD Enable	No	No,Yes	M
* Number of Fans	4	4,6,8	M
Stage Up 2 Deadband	8	1 to 20 °F	M
Stage Up 3 Deadband	10	1 to 20 °F	M
Stage Up 4 Deadband	12	1 to 20 °F	M
Stage Down 0 Deadband	15	1 to 20 °F	M
Stage Down 1 Deadband	7	1 to 20 °F	M
Stage Down 2 Deadband	6	1 to 20 °F	M
Stage Down 3 Deadband	5	1 to 20 °F	M
VFD Max Speed	100%	90 to 110%	M
VFD Min Speed	25%	25 to 60%	M
Sat Condenser Temp Target	100	90 to 130 °F	M
Forced Fan 1	1	1 to # Fans Per Circuit	M
Forced Fan 2	2	1 to # Fans Per Circuit	M
Forced Fan 3	3	1 to # Fans Per Circuit	M

(*) These items are factory set prior to shipment.

(**) Not currently selectable.

Automatic Adjusted Ranges

The following are setpoints that will be limited based on the option selected.

Evaporator Leaving Water Temperature

Mode	Range
Unit Mode = Cool	40 to 60°F
Unit Mode = Cool w/Glycol	20 to 60°F

Evaporator Freeze Temperature

Mode	Range
Unit Mode = Cool	37 to 42°F
Unit Mode = Cool w/Glycol, Ice w/Glycol	18 to 42°F

Low Evaporator Pressure Hold and Unload

Mode	Range
Unit Mode = Cool	55 to 65 Psig
Unit Mode = Cool w/Glycol, Ice w/Glycol	31 to 65 Psig

Low Ambient Lockout Temperature

VFD	Range
VFD = N	35 – 60°F
VFD = Y	-2 – 60°F

Forced Fan 1,2,3

Number of Fans	Range
4	1 – 2 fans
6	1 – 3 fans
8	1 – 4 fans

When the number of fans setting is changed, the forced fan setpoints will default to values as shown in the above table.

Shutdown Alarms

Shutdown alarms (also know as “Stop Alarms” or “Safeties”) execute rapid compressor shutdown and require manual reset. They are also logged in the Alarm Log.

The following table identifies each equipment shutdown alarm, gives the condition that causes the alarm to occur, and states the action taken because of the alarm. If the alarm is auto-clearing, the reset condition is shown below. Otherwise, the alarm is manually reset, requiring the operator to clear the alarm. All shutdown alarms do the following while active:

- Appear in the active alarm menu
- Light the alarm signal on the controller
- Activate the alarm output NO1
- Log the alarm in the Alarm Log

Table 42, Shutdown Alarms

Description	Occurs When:	Action Taken	Reset
No Evaporator Water Flow	Evap Pump State = RUN AND Evap Flow Digital Input = No Flow for time > Evap Flow Proof SP	Rapid Stop Unit	Evap flow switch closes
Low Evaporator Pressure	Evaporator Press < Low Evap Pressure SP for time > Low Evap Pressure Delay SP	Rapid Stop Circuit	Manual
High Condenser Pressure	Condenser Press > High Condenser Pressure SP	Rapid Stop Circuit	Manual
Mechanical High Condenser Pressure/Motor Protect	Digital Input = Off On Power Up: Delay 150 Sec. before checking	Rapid Stop Circuit	Manual
Phase Voltage Protection (opt.)	If Phase Voltage Protection = Y, Then Digital Input Off= Phase/Voltage Problem	Rapid Stop Circuit	Phase/Voltage Input returns to normal
Ground Fault Protection (opt.)	If Phase Voltage Protection = Y, Then Digital Input Off= Phase/Voltage Problem	Rapid Stop Circuit	Manual
Re-Start Fault	Re-Start = Third Time	Rapid Stop Circuit	Manual
Evap. Freeze Protect	Evap LWT < Evaporator Freeze SP AND Unit state = enable	Rapid Stop Unit	Manual
Leaving Evap. Water Temp. Sensor Fault	Sensor shorted or open	Normal Stop Unit	Manual
Evaporator Pressure Sensor Fault	Sensor shorted or open	Rapid Stop Circuit	Manual
Condenser Pressure Sensor Fault	Sensor shorted or open	Rapid Stop Circuit	Manual
Outside Ambient Temp. Sensor Fault	Sensor shorted or open	Normal Stop Unit	Manual

NOTE: SP=SetPoint

Events (Limit Alarms)

The following events limit the operation of the chiller in some way, as described in the Action Taken column. These events are auto-clearing based on reaching the conditions in the reset column. All limit alarms do the following while active:

- Appear in the active alarm menu
- Light the alarm signal on the controller
- Log the alarm in the Alarm Log.

Table 43, Limit Alarms

Description	Occurs When:	Action Taken	Reset
Condenser Pressure Stage Down	Pressure > High Condenser Stage Down setpoint	Shutoff Stage #2	Condenser Press drops below (SP – 100psi)
Low Ambient Lockout	Any compressor is running AND Outside Ambient < Low Amb Lockout SP	Shutoff Stages #1 & #2	Outside Ambient > Low Amb Lockout (SP + 5ºF)
Low Evaporator Pressure – Hold	Pressure < Low Evap Pressure–Hold setpoint	Hold @ Stage 1	Evap Press rises above (SP + 8psi)
Low Evaporator Pressure – Unload	Pressure < Low Evap Pressure–Unload setpoint	Shutoff Stage 2	Evap Press rises above (SP + 10 psi)

NOTE: SP = Setpoint

Logging

When an alarm or event occurs, the description, date, and time are stored in the active alarm buffer corresponding to that alarm, viewed on the Alarm Active screens, and also in the alarm history buffer, viewed on the Alarm Log screens. The active alarm buffers hold a record of all current alarms. The active alarms can be cleared by pressing the Enter key when the end of the list has been reached by scrolling. Active alarms may only be cleared if the appropriate password level is active.

A separate alarm log stores the last 25 alarms and events that occur. When an alarm or event occurs, it is put into the first slot in the alarm log, and all others are moved down one, dropping the last entry. The date and time of the occurrence are stored in the alarm log, as well as the unit state. If the alarm is a circuit alarm, then the circuit state, refrigerant pressures and temperatures, and number of fans on are also stored. The parameters may be accessed by scrolling to the last line on the alarm log screen (similar to a setpoint).

Control Logic

Unit Enable

Enabling and disabling the chiller is controlled by the Unit Enable Setpoint, with options of OFF and ON. This setpoint can be altered by the Unit Off Input, Digital Input, keypad entry, or BAS request. The Control Source setpoint determines which source can change the Unit Enable setpoint with options of DIGITAL INPUT, KEYPAD, or BAS.

Changing the Unit Enable Setpoint can be accomplished according to the following table.

Table 44, Unit Enable Conditions

Unit Off Input	Control Source Setpoint	Remote Input	Keypad Entry	BAS Request	Enable
OFF	x	x	x	x	OFF
x	SWITCHES	OFF	x	x	OFF
ON	SWITCHES	ON	x	x	ON
ON	KEYPAD	X	OFF	x	OFF
ON	KEYPAD	X	ON	x	ON
ON	NETWORK	x	x	OFF	OFF
On	NETWORK	OFF	x	x	OFF
ON	NETWORK	ON	x	ON	ON

NOTE: An “x” indicates that the value is ignored.

Unit Mode Selection

The overall operating mode of the chiller is set by the Unit Mode Setpoint with options of COOL, COOL w/Glycol, ICE w/Glycol, and TEST. This mode setting can be altered by the keypad, BAS, and Mode input. Changes to the Unit Mode Setpoint are controlled by two additional setpoints:

- Available Modes Setpoint: Determines the operational modes available at any time with options of COOL, COOL w/Glycol, COOL/ICE w/Glycol, and TEST.
- Control Source Setpoint: Determines the source that can change the Unit Mode Setpoint with options of DIGITAL INPUT, KEYPAD, or BAS.

When the Control source is set to KEYPAD, the Unit Mode stays at its previous setting until changed by the operator. When the Control source is set to BAS, the most recent BAS mode request goes into effect even if it changed while the Control source was set to KEYPAD or DIGITAL INPUTS.

Changing the Unit Mode Setpoint can be accomplished according to the following table.

Table 45, Unit Mode Selection

Control Source Setpoint	Mode Input	Keypad Entry	BAS Request	Available Modes Setpoint	Unit Mode
x	x	x	x	COOL	COOL
x	x	x	x	COOL w/Glycol	COOL w/Glycol
SWITCHES	OFF	x	x	COOL/ICE w/Glycol	COOL w/Glycol
SWITCHES	ON	x	x	COOL/ICE w/Glycol	ICE w/Glycol
KEYPAD	x	COOL w/Glycol	x	COOL/ICE w/Glycol	COOL w/Glycol
KEYPAD	x	ICE w/Glycol	x	COOL/ICE w/Glycol	ICE w/Glycol
NETWORK	x	x	COOL	COOL/ICE w/Glycol	COOL w/Glycol
NETWORK	x	x	ICE	COOL/ICE w/Glycol	ICE w/Glycol
x	x	x	x	ICE w/Glycol	ICE w/Glycol
x	x	x	x	TEST	TEST

NOTE: An “x” indicates that the value is ignored.

Unit Test Mode

The unit test mode allows manual testing of controller outputs. Entering this mode requires the following conditions:

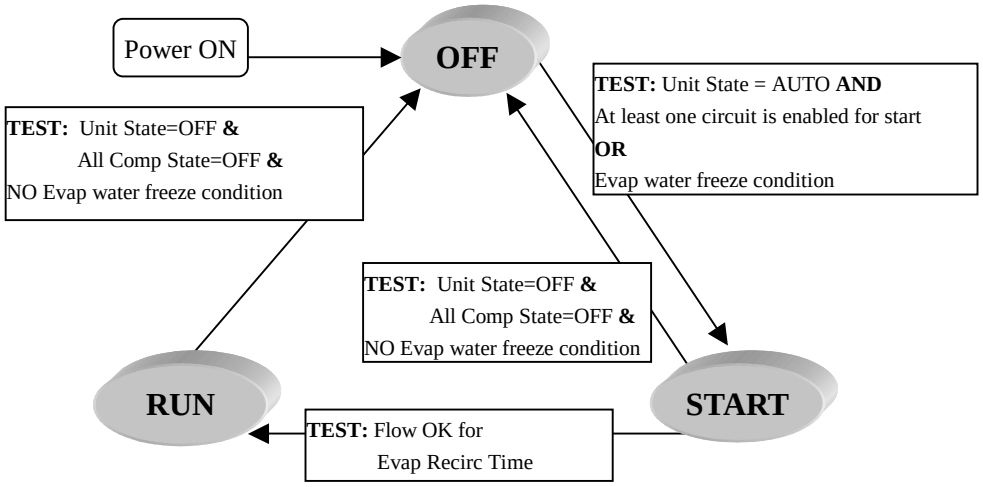
- Unit OFF input = OFF (i.e., entire chiller is shut down).
- Manager password active.
- Available Unit Mode setpoint = TEST.

A test menu can then be selected to allow activation of the outputs. It is possible to switch each digital output ON or OFF and set the analog outputs to any value.

When in test mode, the compressors may be turned on but they will automatically shut off after 10 seconds.

Chilled Water Pump Control

Operation of the evaporator pump is controlled by the state-transition diagram shown below.



The evaporator pump is cycled by the controller. If the unit is enabled and at least one circuit is able to run, the controller sends a signal to start the pump (terminals #33 and #35 on TB1). If water flow is sensed for a period of time from the flow switch (terminals #44 and #61 on TB1), the unit will start at a call for cooling. This time delay is set in Set menu #5 with a default of 30 seconds.

Compressor Control

Compressor Sequencing

This section defines which compressor is the next one to start or stop. The next section defines when the start, or stop, is to occur.

Compressor sequencing is based primarily on compressor run-hours and starts. Compressors with fewer starts will start before those with more starts. Compressors that have more run-hours will shut off before those with less run-hours. In the event of a tie on number of starts, the lower numbered compressor starts first. In the event of a tie on run-hours, the lower numbered compressor shuts off first.

If possible, the number of running compressors on each circuit will be balanced. If a circuit is unavailable for any reason, the other circuit is allowed to stage on all compressors.

Required Parameters

- Number of starts for all compressors
- Number of run-hours for all compressors
- Status of all compressors (Available/Unavailable)
- Compressor number

Compressor Start/Stop Timing-Cool Mode

This section defines when a compressor is to start, or stop, and the scenario for doing so.

Required Parameters

1. Start Delta setpoint
2. Max Pulldown Rate setpoint
3. Evap Delta T setpoint
4. Number of Compressors/Circuit setpoint
5. LWT error
6. LWT Slope
7. Number of compressors running
8. Interstage timer status

Stage Up

For 2 compressors/circuit:
Control band = Evap Delta T x .25

For 3 compressors/circuit:
Control band = Evap Delta T x .17

IF [LWT Error > Startup_Delta_T_SP + 0.5(Control band)
AND No Compressors Running
AND Stage Up Timer Expired]
THEN Stage_Up_Now = YES
OR ELSE, IF
[LWT Error > 0.5(Control band) AND LWT Slope <= Max Pulldown setpoint
AND Stage Up Timer Expired]
THEN Stage_Up_Now = YES

Stage Down

IF [LWT Error < -0.5(Control band)
AND Stage Down Timer Expires**]**
THEN Stage_Down_Now = YES

Compressor Start/Stop Timing – Ice Mode

This section defines when a compressor is to start, or stop, and the scenario for doing so.

Required Parameters

Start Delta setpoint
Evap Delta T setpoint
Number of Compressors/Circuit setpoint
LWT error
Number of compressors running
Interstage timer status

Ice timer status (12 hours between starts)

Stage Up

For 2 compressors/circuit:

Control band = Evap Delta T x .3

For 3 compressors/circuit:

Control band = Evap Delta T x .2

IF

[LWT Error > Startup_Delta_T_SP + 0.5(Control band)

AND Number Comps Running = 0

AND Ice Timer Expired]

THEN Stage_Up_Now = YES

ELSE IF

[LWT Error > 0

AND Number Comps Running > 0

AND Stage Up Timer Expired]

THEN Stage_Up_Now = YES

Stage Down

IF LWT Error < 0

THEN Stage_Down_Now = YES

Leaving Water Reset

The leaving water reset input uses a 4-20mA signal to reset the leaving water setpoint to a higher value. The adjustment varies linearly from 0 degrees F to 10 degrees F, with a reset of 0 for a 4mA signal and a reset of 10 for a 20mA signal.

At all times, the active leaving water setpoint is limited to a maximum of 60°F. The reset remains proportional within the 10 degree band, but the setpoint will simply stop resetting when it reaches the maximum.

Circuit Capacity Overrides – Limits of Operation

The following conditions override the automatic capacity control when the chiller is in COOL mode or ICE mode. These overrides keep a circuit from entering a condition in which it is not designed to run.

Low Evaporator Pressure

If a circuit is running, and the evaporator pressure drops below the Low Evaporator Pressure-Hold setpoint, no more compressors will be allowed to start on that circuit. This limit is active until the evaporator pressure reaches the hold setpoint plus 8 psi.

If a circuit is running with two or three compressors on, and the evaporator pressure drops below the Low Evaporator Pressure-Unload setpoint, the circuit will begin reducing capacity. If two compressors are running, one of the running compressors will be stopped. If three compressors are running, then one compressor will be stopped initially. Ten seconds later, if the pressure has not

risen above the unload setpoint, another compressor will be stopped. The last compressor on a circuit will not stop due to the unload condition.

High Condenser Pressure

If the discharge pressure rises above the High Condenser Pressure Unload setpoint, and more than one compressor on the circuit is running, the circuit will stage down. One compressor will shutdown as soon as the pressure rises above the unload setpoint, and if two remain running, then one more will shut down 10 seconds later, if the pressure is still above the unload setpoint. No stage up will be allowed on the circuit until the condenser pressure drops to the unload setpoint, less 100 psi, and the outdoor ambient temperature drops 5 degrees F.

Low Ambient Lockout

If the OAT drops below the low ambient lockout setpoint, then all running circuits will do a normal stop. Once the lockout has been triggered, no compressors will start until the OAT rises to the lockout setpoint plus 5 degrees F.

High Ambient Limit

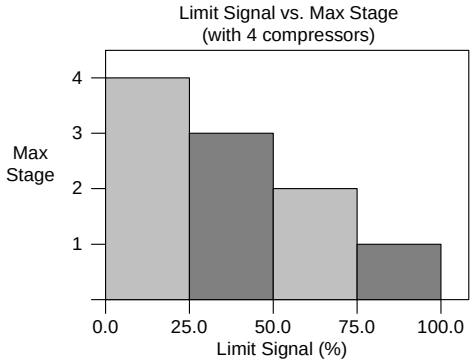
On units not configured with multi-point power connections, the maximum load amps could be exceeded at high ambient temperatures. If all circuit 1 compressors are running or all but one compressor on circuit 1, power connection is single point, and the OAT is greater than 116°F, circuit 2 is limited to running all but one compressor. The circuit 2 status will indicate if this is the case. This action will allow the unit to operate at higher temperatures than 116°F.

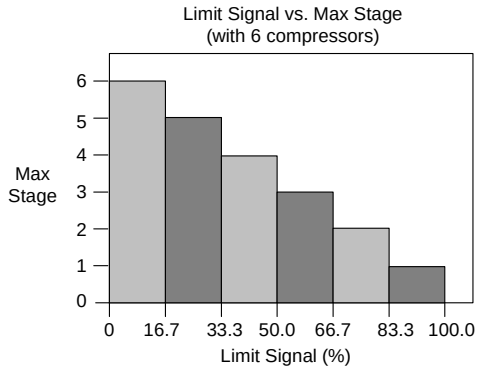
Unit Capacity Overrides

The following conditions override the automatic capacity control when the chiller is in COOL mode only.

Demand Limit

The maximum unit capacity can be limited by a 4-to-20 mA signal on the Demand Limit analog input. This function is only enabled if the Demand Limit setpoint is set to ON. The maximum unit capacity stage is determined as shown in the following graphs:





Maximum LWT Rate

The maximum rate at which the leaving water temperature can drop is limited at all times by the Maximum Rate setpoint. If the rate exceeds this setpoint, no more compressors will be started until the pulldown rate is less than the setpoint.

Pumpdown

When a circuit reaches a condition where it needs to shut down normally, a pumpdown cycle will be performed. All but the lowest numbered running compressor will shut off. During pumpdown, the hot gas bypass and liquid line valves are closed, while a compressor continues to run. The pumpdown is complete when the evaporator pressure is less than the low evaporator pressure unload setpoint, less 15 psi, or the circuit has been in the pumpdown state for 60 seconds.

Standard Condenser Fan Control

Stage Up Compensation

In order to create a smoother transition when another fan is staged on, the VFD compensates by slowing down initially. This is accomplished by adding the new fan stage up deadband to the VFD target. The higher target causes the VFD logic to decrease fan speed. Then, every 10 seconds, 0.5 degree F is subtracted from the VFD target until it is equal to the saturated condenser temperature target setpoint. This will allow the VFD to slowly bring the saturated condenser temperature back down.

Fantrol

Condenser Fans Staging is based on condenser pressure as selected by Fan Stage On & Off setpoints. Fans 1, 3, 5, and 7 are for circuit 1, and fans 2, 4, 6, and 8 are for circuit 2. Fans 1 and 2 start with the first compressor on the respective circuit when the ambient temperature is greater than 75°F. Below 75°F, these fans start when the condenser pressure gets up to the stage on setpoint. The compressor must be running in order to run any fans.

Fan Stages

There are 2, 3, or 4 fans available per circuit. On 8 fan units, fans 5/7 and 6/8 are controlled by one contactor for each pair, using virtual stages to allow a difference of only one fan between stages. See the tables below:

4 and 6 Fan Units

Stage (3-Fan)	Fans On Cir. 1	Fans On Cir. 2
1	1	2
2	1,3	2,4
3	1,3,5	2,4,6

8 Fan Units

Stage (2&4-Fan)	Fans On Cir 1	Fans On Cir. 2
1	1	2
2	1,3	2,4
3	1,5,7	2,6,8
4	1,3,5,7	2,4,6,8

Normal Operation - Staging Up

At startup, the first fan will start when the saturated condenser temperature rises above the target. After this, the stage up deadbands apply.

When the saturated condenser temperature is above the Target + the active deadband, a Stage Up error is accumulated.

Stage Up Error Step = Saturated Condenser Refrigerant temperature – (Target + Stage Up deadband).

The Stage Up Error Step is added to Stage Up Accumulator once every Stage Up Error Delay seconds. When Stage Up Error Accumulator is greater than the Stage Up Error Setpoint another stage is started.

When a stage up occurs or the saturated condenser temperature falls back within the Stage Up deadband the Stage Up Accumulator is reset to zero.

Normal Operation - Staging Down

There are four Stage Down deadbands, one for each stage.

When the saturated condenser refrigerant temperature is below the Target – the active deadband, a Stage Down error is accumulated.

Stage Down Error Step = (Target – Stage Down deadband) – Saturated Condenser Refrigerant temperature.

The Stage Down Error Step is added to Stage Down Accumulator once every Stage Down Error Delay Second. When the Stage Down Error Accumulator is greater than the Stage Down Error Setpoint, another stage of condenser fans turns off. The last stage on will not shut off until the circuit is in an off state.

When a stage down occurs, or the saturated temperature rises back within the Stage Down deadband, the Stage Down Error Accumulator is reset to zero.

Forced Fan Stage At Start

Fans may be started simultaneously with the compressor based on outdoor ambient temperature. When the compressor starts, a Fantrol stage is forced based on the following table.

Table 46, Forced Fan Staging

	Fantrol Stage At Start
> 75 °F	Forced Fan 1 SP
> 90 °F	Forced Fan 2 SP
> 105 °F	Forced Fan 3 SP

Up to four fans may be forced on when the compressor starts. If the unit has the Optional Low Ambient VFD option, then only three fans can start with the compressor, and the VFD will start normally when the saturated condenser temperature is higher than the target.

After forcing fans on, the saturated condenser temperature may temporarily stay below the target by some amount. In order to keep these fans from staging off, no stage down error can be accumulated until either the OAT drops below 75°F, or the saturated condenser temperature goes above the target.

Optional VFD Low Ambient Fan Control

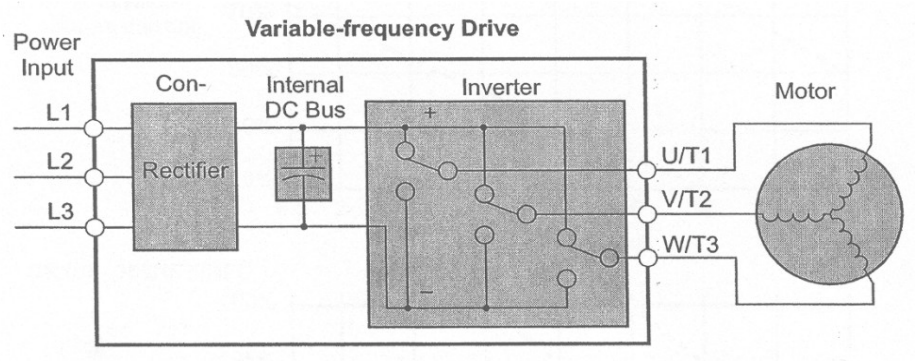
Low ambient air temperature fan control is accomplished by using the optional Low Ambient VFD to control the speed of the first fan on each circuit. This VFD control uses a proportional integral function to drive the saturated condenser temperature to a target value by changing the fan speed. The target value is normally the same as the saturated condenser temperature target setpoint.

The fan VFD always starts when the saturated condenser temperature rises higher than the target.

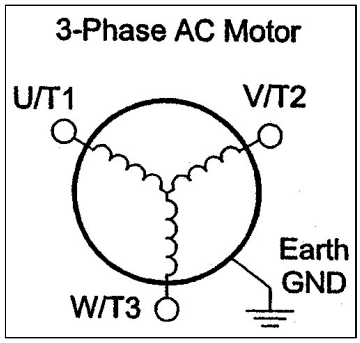
What is an Inverter?

The term inverter and variable-frequency drive are related and somewhat interchangeable. An electronic motor drive for an AC motor controls the motor's speed by varying the frequency of the power sent to the motor.

An inverter, in general, is a device that converts DC power to AC power. The figure below shows how the variable-frequency drive employs an internal inverter. The drive first converts incoming AC power to DC through a rectifier bridge, creating an internal DC bus voltage. Then the inverter circuit converts the DC back to AC again to power the motor. The special inverter can vary its output frequency and voltage according to the desired motor speed.



Inverter Output to the Motor



The AC motor must be connected only to the inverter's output terminals. The output terminals are uniquely labeled (to differentiate them from the input terminals) with the designations U/T1, V/T2, and W/T3. This corresponds to typical motor lead connection designations T1, T2, and T3. The consequence of swapping any two of the three connections is the reversal of the motor direction. This must not be done. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.

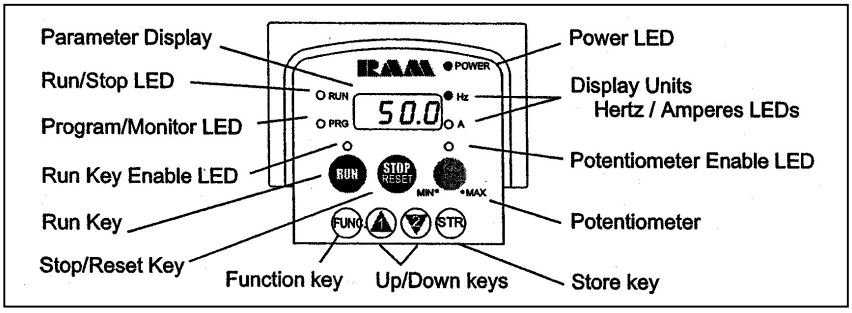
Notice the three connections to the motor do not include one marked "Neutral" or "Return." The motor represents a balanced "Y" impedance to the inverter, so there is no need for a separate return. In other words, each of the three "Hot" connections serves also as a return for the other connections, because of their phase relationship.

Do not to switch off power to the inverter *while the motor is running* (unless it is an emergency stop). Also, do not install or use disconnect switches in the wiring from the inverter to the motor (except thermal disconnect).

Inverter Front Panel Keypad

The CR100 Series inverter front keypad contains all the elements for both monitoring and programming parameters. The keypad layout is pictured below. The fan VFD is programmed in the factory before shipment and no field programming is required.

Key and Indicator Legend



Run/Stop LED - ON when the inverter output is ON and the motor is developing torque (Run Mode), and OFF when the inverter output is OFF (Stop Mode).

Program/Monitor LED - This LED is ON when the inverter is ready for parameter editing (Program Mode). It is OFF when the parameter display is monitoring data (Monitor Mode).

Run Key Enable LED - is ON when the inverter is ready to respond to the Run key, OFF when the Run key is disabled.

Run Key - Press this key to run the motor (the Run Enable LED must be ON first). Parameter F_04, Keypad Run Key Routing, determines whether the Run key generates a Run FWD or Run REV command.

Stop/Reset Key - Press this key to stop the motor when it is running (uses the programmed deceleration rate). This key will also reset an alarm that has tripped.

Potentiometer -Allows an operator to directly set the motor speed when the potentiometer is enabled for output frequency control.

Potentiometer Enable LED - ON when the potentiometer is enabled for value entry.

Parameter Display - A 4-digit, 7-segment display for parameters and function codes.

Display Units, Hertz/Amperes - One of these LEDs will be ON to indicate the units associated with the parameter display.

Power LED - This LED is ON when the power input to the inverter is ON.

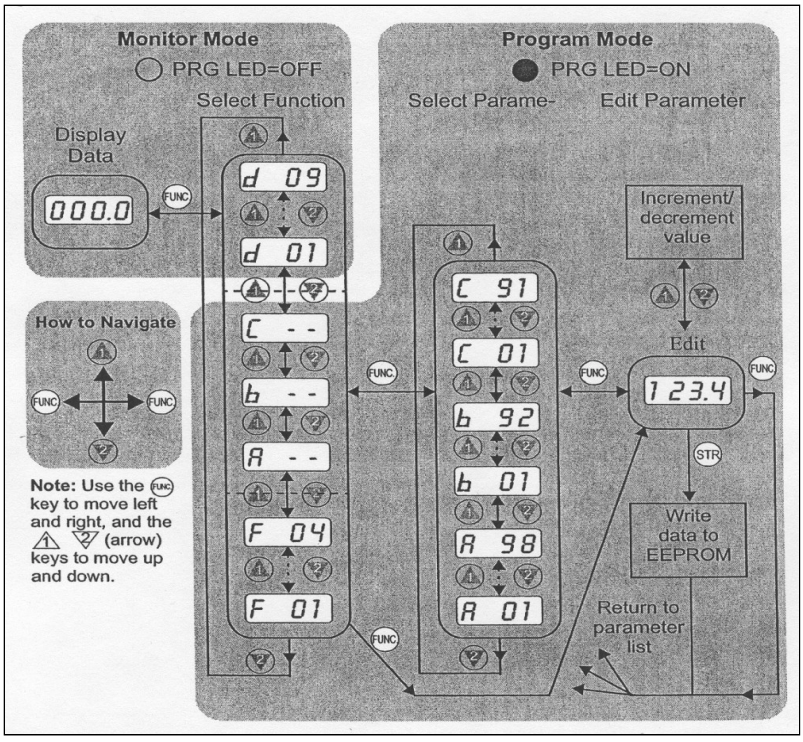
Function Key - This key is used to navigate through the lists of parameters and functions for setting and monitoring parameter values.

Up/Down (▲1 , ▼2) Keys - Use these keys alternately to move up or down the lists of parameter and functions shown in the display, and increment/decrement values.

Store (STR) Key - When the unit is in Program Mode and you have edited a parameter value, press the Store key to write the new value to the EEPROM.

Keypad Navigational Map

The CR100 Series inverter front keypad contains all the elements for both monitoring and programming parameters. The diagram below shows the basic navigational map of parameters and functions.



NOTE: The inverter 7-segment display shows lower case “b” and “d,” meaning the same as the upper case letters “B” and “D” used in this manual (for uniformity “A to F”).

NOTE: The Store Key saves the edited parameter (shown in the display) to the EEPROM in the inverter, regardless of the programming device. Upload and download of parameters is accomplished through a separate command—do not confuse *Store* with *Download* or *Upload*.

Troubleshooting Tips

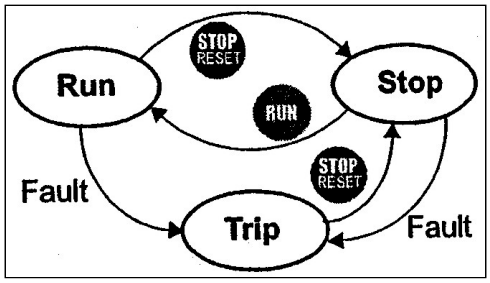
The table below lists typical symptoms and the corresponding solution(s).

Symptom Condition		Probable Cause	Solution
The motor will not run.	The inverter outputs [U], [V], [W] are not supplying voltage.	• Is the frequency command source A_01 parameter setting correct? • Is the Run command source A-02 parameter setting correct?	• Make sure the parameter setting A-01 is correct. • Make sure the parameter setting A-02 is correct.
		• Is power being supplied to terminals [L1], [L2], and [L3/N]? If so, the POWER lamp should be ON.	• Check terminals [L1], [L2], and [L3/N], then [U/T1], [V/T2], and [W/T3]. • Turn ON the power supply or check fuses.
		• Is there an error code *E X X* displayed?	• Press the Func. key and determine the error type. Eliminate the error cause, then clear the error (Reset).
		• Are the signals to the intelligent input terminals correct? • Is the Run Command active? Is the {FW] terminal (or [RV]) connected to [P24] (via switch, etc.)	• Verify the terminal functions for C_01 – C_05 are correct. • Turn ON Run Command enable. • Supply 24V to {FW] or [RV] terminal, if configured.
		• Has the frequency setting for F_01 been set greater than zero? • Are the control circuit terminals [H], [O], and [L] connected to the potentiometer?	• Set the parameter for F_01 to a safe, non-zero value. • If the potentiometer is the frequency setting source, verify voltage at [O] > 0V.
		• Is the RS (reset) function or FRS (free-run stop) function ON?	• Turn OFF the command(s).
	Inverter outputs [U], [V], [W] are supplying voltage.	• Is the motor load too heavy?	• Reduce load, and test the motor independently.
	The optional remote operator is used (SRW).	• Are the operational settings between the remote operator and the inverter unit correct?	• Check the operator type setting.
The direction of the motor is reversed.		• Are the connections of output terminals [U/T1], [V/T2], and [W/T3] correct? • Is the phase sequence of the motor forward or reverse with respect to [U/T1], [V/T2], and [W/T3]?	• Make connections according to the phase sequence of the motor. In general: FWD = U-V-W, and REV = U-W-V.
		• Are the control terminals [FW] and [RW] wired correctly? • Is parameter F_04 properly set?	• Use terminal [FW] for forward, and [RV] for reverse. • Set motor direction in F_04.
The motor speed will not reach the target frequency (desired speed).		• If using the analog input, is the current or voltage at [O] or [OI]?	• Reduce the load. • Heavy loads activate the overload restriction feature (reduces output as needed).
		• Is the load too heavy?	• Reduce the load • Heavy loads activate the overload restriction feature (reduces output as needed).
		• Is the inverter internally limiting the output frequency?	• Check max frequency setting (A_04). • Check frequency upper limit setting (A_61).
The RPM of the motor does not match the inverter output frequency setting.		• Is the maximum frequency setting A_04 correct? • Does the monitor function D_01 display the expected output frequency?	• Verify the V/f settings match motor specification. • Make sure all scaling (such as A_11 to A_14) is properly set.
Inverter data is not correct.	No downloads have occurred.	• Was power turned OFF after a parameter edit but before pressing the Store key?	• Edit the data and press the Store key once.
		• Edits to data are permanently stores at power down. Was the time from power OFF to power ON less than six seconds?	• Wait six seconds or more before turning power OFF after editing data.
	A download to the inverter was attempted.	• Was the power turned OFF within six seconds after the display changed from REMT to INV?	• Copy data to the inverter again, and keep power ON for six seconds or more after copying.
A parameter will not change after an edit (reverts to old setting).	True for certain parameters.	• Is the inverter in Run Mode? Some parameters cannot be edited during Run Mode.	• Put inverter in Stop Mode (press the Stop/reset key). Then edit the parameter.
	True for all parameters.	• If you're using the [SFT] intelligent input (software lock function)—is the [SFT] input ON?	• Change the state of the SFT input, and check the B_31 parameter (SFT mode).

Monitoring Trip Events, History. & Conditions

Fault Detection and Clearing

The microprocessor in the inverter detects a variety of fault conditions and captures the event, recording it in a history table. The inverter output turns OFF, or "trips" similar to the way a circuit breaker trips due to an over-current condition. Most faults occur when the motor is running (refer to the diagram to the right). However, the inverter could have an internal fault and trip in Stop Mode. In either case, you can clear the fault by pressing the Stop/Reset key.



Error Codes

An error code will appear on the display automatically when a fault causes the inverter to trip. The following table lists the cause associated with the error.

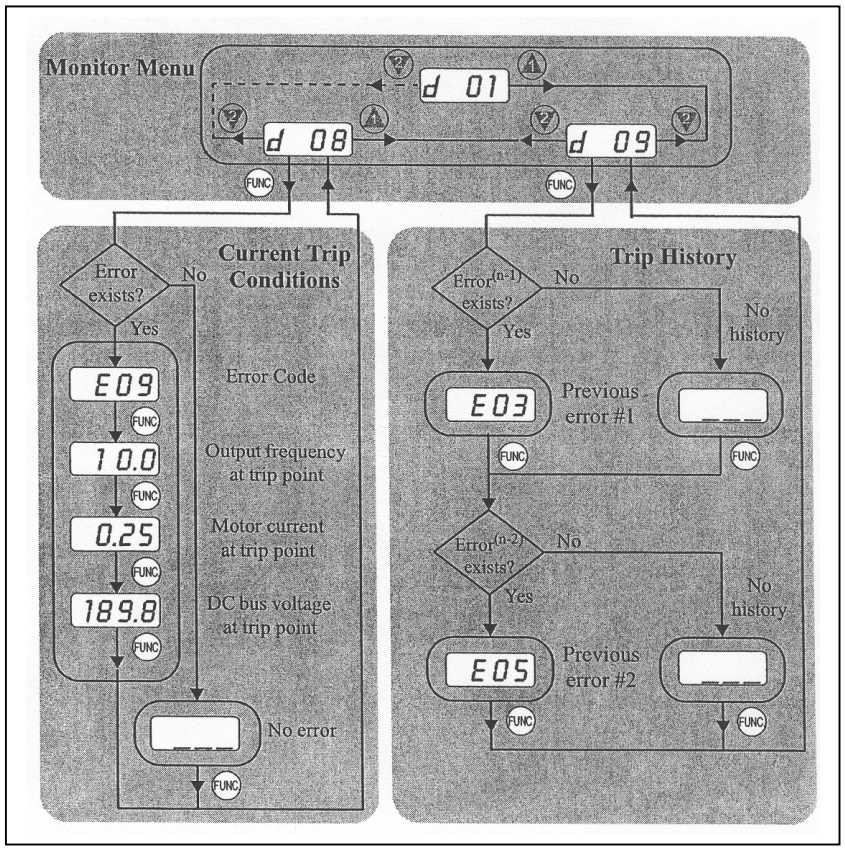
Error Code	Name	Cause(s)
E01	Over current event while at constant speed	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current *for the* inverter, so the inverter output is turned OFF. The dual-voltage motor is wired incorrectly.
E02	Over current event during deceleration	
E03	Over current event during acceleration	
E04	Over current event during other conditions	
E05	Overload protection	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output.
E07	Over voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.
E08	EEPROM error	When the built-in EEPROM memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.
E09	Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.
E11 *E22*	CPU error	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.
E12	External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.
E13	USP	When the Unattended Start Protection (LJSP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.
E14	Ground fault	The inverter is protected by the detection of ground faults between the inverter output and the motor during powerup tests. This feature protects the inverter, and does not protect humans.
E15	Input over-voltage	When the input voltage is higher than the specified value, it is detected 100 seconds after powerup and the inverter trips and turns OFF its output.
E21	Inverter thermal trip	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.
E35	Thermistor	When a thermistor is connected to terminals {5} and [CM1] and the inverter has sensed the temperature is too high, the inverter trips and turns OFF the output.
---U	Under-voltage (brownout) with output shutoff	Due to low input voltage, the inverter turns its output OFF and tries to restart. If it fails to restart, then the alarm trips to record the under-voltage error event.

Note: If an EEPROM error (E08) occurs, be sure to confirm the parameter data values are still correct. If the power is turned OFF while the [RS] (Reset) intelligent input terminal is ON, an EEPROM error will occur when power is restored.

Trip History and Inverter Status

Always find the cause of the fault before clearing it. When a fault occurs, the inverter stores important performance data at the moment of the fault. To access the data, use the monitor functions (D_xx) and select D_08 for details about the present fault (E^{n}), or the error code for the past two trip events (E^{n-1}) and E^{n-2}) using the D_09 Trip History function.

The following Monitor Menu map shows how to access the error codes. When fault(s) exist, you can review their details by first selecting the proper function: D_08 displays current trip data, and D09 displays trip history.



VFD Monthly and Yearly Inspection Chart

Item Inspected		Check for ...	Frequency		Inspection Method	Criteria
			Month	Year		
Overall	Ambient environment	Extreme Temperatures & humidity	✓		Thermometer, hygrometer	Ambient temperature between – 10 to 40°C, non-condensing
	Major devices	Abnormal noise & vibration	✓		Visual & aural	Stable environment for electronic controls
	Power supply voltage	Voltage tolerance	✓		Digital volt meter, measure between inverter terminals [L1], [L2], [L3}	200V class: 200 to 240V 50/60 Hz 400V class: 380 to 460V 50/60 Hz
Main circuit	Ground Insulation	Adequate resistance		✓	Digital volt meter, GND to terminals	5 Meg. Ohms or greater
	Mounting	No loose screws		✓	Torque wrench	M3: 0.5 – 0.6 Nm M4: 0.98 – 1.3 Nm M5: 1.5 – 2.0 Nm
	Components	Overheating		✓	Thermal trip events	No trip events
	Housing	Dirt, dust		✓	Visual	Vacuum dust & dirt
	Terminal block	Secure connections		✓	Visual	No abnormalities
	Smoothing capacitor	Leading, swelling	✓		Visual	No abnormalities
	Relay(s)	Chattering		✓	Aural	Single click when switching ON or OFF
	Resistors	Cracks or discoloring		✓	Visual	Use Ohm meter to check braking resistors
	Cooling fan	Noise	✓		Power down, manually rotate	Rotation must be smooth
		Dust	✓		Visual	Vacuum to clean
Control circuit	Overall	No order, discoloring, corrosion		✓	Visual	No abnormalities
	Capacitor	No leaks or deformation	✓		Visual	Undistorted appearance
Display	LEDs	Legibility	✓		Visual	All LED segments work

Important Messages

WARNING

WARNING HIGH VOLTAGE: Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housings or protrusions at or above line potential. Extreme care should be taken to protect against shock.

Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating machinery.

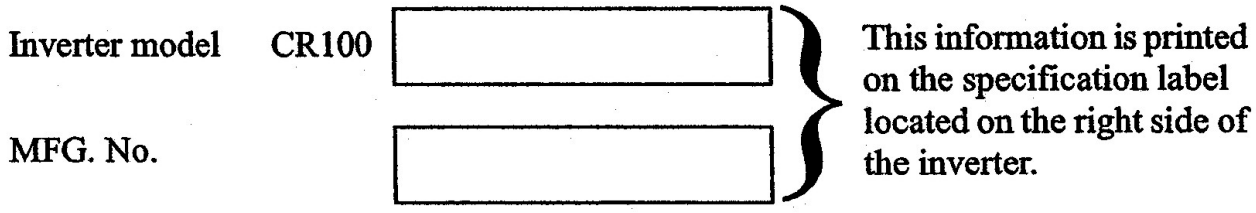
WARNING

Wait at least five (5) minutes after turning OFF the input power supply before performing maintenance or an inspection. Otherwise, there is the danger of electric shock.

Introduction

This end of this section lists the parameters for the CR100 series inverters and the values as programmed in the factory.

Unit identification


Inverter model
CR100
MFG. No.
This information is printed on the specification label located on the right side of the inverter.

Parameter Settings for Keypad Entry

Main Profile Parameters

"F" Group Parameters		McQuay Setting
Function Code	Name	
F_01	Output Frequency Setting	0.0
F_02	Acceleration (1)	10.0
F_03	Deceleration (1)	10.0
F_04	Keypad Run Key Routing	00

Standard Functions

"A" Group Parameters		McQuay Setting
Function Code	Name	
A_01	Frequency source setting	01
A_02	Run command source setting	01
A_03	Base frequency setting	60.0
A_04	Maximum frequency setting	60.0
A_11	O-L input active range start frequency	0
A_12	O-L input active range end frequency	0
A_13	O-L input active range start voltage	0
A_14	O-L input active range end voltage	100
A_15	O-L input start frequency enable	01
A_16	External frequency filter time constant	8
A_20	Multi-speed 0 setting	0
A_21	Multi-speed 1 setting	0
A_22	Multi-speed 2 setting	0
A_23	Multi-speed 3 setting	0
A_24	Multi-speed 4 setting	0
A_25	Multi-speed 5 setting	0
A_26	Multi-speed 6 setting	0
A_27	Multi-speed 7 setting	0
A_28	Multi-speed 8 setting	0
A_29	Multi-speed 9 setting	0
A_30	Multi-speed 10 setting	0
A_31	Multi-speed 11 setting	0
A_32	Multi-speed 12 setting	0
A_33	Multi-speed 13 setting	0
A_34	Multi-speed 14 setting	0
A_35	Multi-speed 15 setting	0
A_38	Jog frequency setting	1.0
A_39	Jog stop mode	00
A_41	Torque boost method selection	00
A_42	Manual torque boost value	11
A_43	Manual torque boost frequency adjustment	10.0
A_44	V/f characteristic curve selection	00
A_45	V/f gain setting	100
A_51	DC braking enable	00
A_52	DC braking frequency setting	0.5

"A" Group Parameters		McQuay Setting
Function Code	Name	
A_53	DC braking wait time	0.0
A_54	DC braking force during deceleration	0
A_55	DC braking time during deceleration	0.0
A_61	Frequency upper limit setting	0.0
A_62	Frequency lower limit setting	0.0
A_63 A_65 A_67	Jump (center) frequency setting	0.0
A_64 A_66 A_68	Jump (hysteresis) frequency width setting	0.5
A_71	PID Enable	00
A_72	PID proportional gain	1.0
A_73	PID integral time constant	1.0
A_74	PID derivative gain	0.0
A_75	PV scale conversion	1.00
A_76	PV source setting	00
A_81	AVR function select	00
A_82	AVR voltage select	230/460
A_92	Second acceleration time setting	15.0
A_93	Second deceleration time setting	15.0
A_94	Select method to switch to second accel/decel profile	00
A_95	Acc1 to Acc2 frequency transition point	0.0
A_96	Dec1 to Dec2 frequency transition point	0.0
A_97	Acceleration curve selection	00
A_98	Deceleration curve selection	00

Fine Tuning Functions

"B" Group Parameters		McQuay Setting
Function Code	**Name**	
B_01	Selection of automatic restart	00
B_02	Allowable under-voltage power failure time	1.0
B_03	Retry wait time before motor restart	1.0
B_12	Level of electronic thermal setting	Rated current for each inverter
B_13	Electronic thermal characteristic	01
B_21	Overload restriction operation mode	01
B_22	Overload restriction setting	Rated current x 1.25
B_23	Deceleration rate at overload restriction	1.0
B_31	Software lock mode selection	01
B_32	Reactive current setting	Rated current x 0.58
B_81	{FM] terminal analog meter adjustment	80
B_82	Start frequency adjustment	0.5
B_83	Carrier frequency setting	5.0
B_84	Initialization mode (parameters or trip history)	00
B_85	Country code for initialization	02
B_86	Frequency scaling conversion factor	1.0
B_87	STOP key enable	00
B_88	Restart mode after FRS	00
B_89	Data select for digital op. OPE-J	01

Intelligent Terminal Functions

"C" Group Parameters		McQuay Setting
Function Code	**Name**	
C_01	Terminal [1] function	00
C_02	Terminal [2] function	01
C_03	Terminal [3] function	16
C_04	Terminal [4] function	13
C_05	Terminal [5] function	18
C_11	Terminal [1] active state	00
C_12	Terminal [2] active state	00
C_13	Terminal [3] active state	00
C_14	Terminal [4] active state	01
C_15	Terminal [5] active state	00
C_21	Terminal [11] function	01
C_22	Terminal [12] function	00
C_23	[FM] signal selection	00
C_31	Terminal [11] active state (-FU)	00
	Reserved (-FE / FR)	
C_32	Terminal [12] active state (-FU)	00
	Terminal [11] active state (-FE / FR)	
C_33	Alarm relay terminal active state	01
C_41	Overload level setting	Inverter rated current
C_42	Frequency arrival setting for accel	0.0
C_43	Arrival frequency setting for decel	0.0
C_44	PID deviation level setting	3.0
C_91	Debug mode enable	00

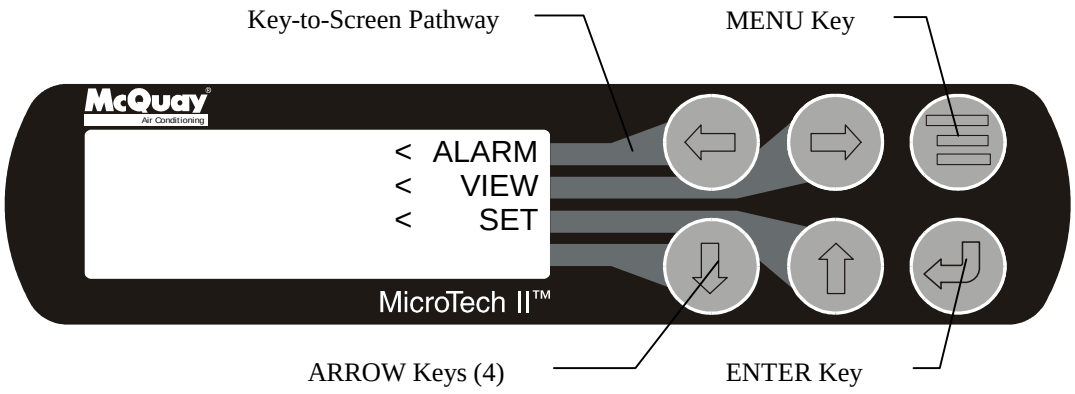
Using the Controller

4x20 Display & Keypad

Layout

The 4-line by 20-character/line liquid crystal display and 6-key keypad are shown below.

Figure 30, Display (in MENU mode) and Keypad Layout



Note that each ARROW key has a pathway to a line in the display. Pressing an ARROW key will activate the associated line when in the MENU mode.

Getting Started

There are two basic procedures to learn in order to utilize the MicroTech II controller:

1. Knowing where a particular screen is located and how to navigate to reach it.
2. Knowing what is contained in a menu screen and how to read that information or how to change a setpoint contained in the menu screen.

Powering Up

When the controller is powering up, the following screen appears:

```
selftest
please wait
```

When the self test is complete, the following screen will appear automatically:

```
McQuay
MicroTech II
ACZ-Dual Circuit
Ver: AGZD20101A
```

Ver: is the software version install in the controller.

Version Number

The software version number is displayed during power up (see above) and can be accessed at any time by pressing the MENU Key and the ENTER Key simultaneously.

Navigating Through the Menus

The menus are arranged in a matrix of screens across a top horizontal row. Some of these top-level screens have sub-screens located under them. The general content of each screen and its location in the matrix are shown in Figure 32 on page 80. A detailed description of each menu begins on page 81.

There are two ways to navigate through the menu matrix to reach a desired menu screen.

1. Scroll Mode: Scroll through the matrix from one screen to another using the four ARROW keys.
2. Menu Mode: Use shortcuts to work through the matrix hierarchy. From any menu screen, pressing the MENU key will take you to the top level of the hierarchy. The display will show ALARM, VIEW, and SET as shown in Figure 30. This corresponds to the second row of screens on Figure 32. One of these groups of screens can then be selected by pressing the key connected to it via the pathway shown in Figure 30.

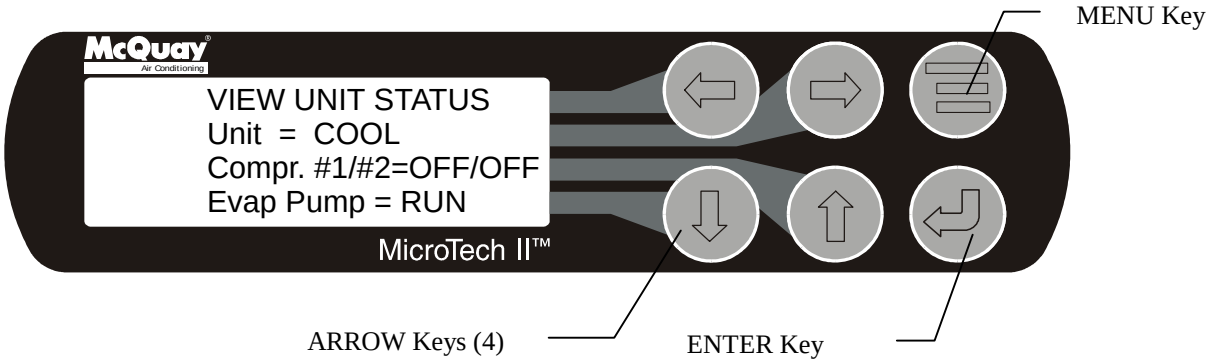
For example, selecting ALARM will go the next row of menus under ALARM (ALARM LOG or ACTIVE ALARM). Selecting VIEW will go the next level of screens under VIEW (VIEW UNIT STATUS or VIEW UNIT TEMP). Selecting SET will go to a series of screens for looking at and changing setpoints.

MENU Key

The MENU key is used to switch between the shortcut method (known as the MENU mode and as shown in Figure 30) and scrolling method (known as the SCROLL mode shown in Figure 31). The MENU mode is the shortcut to specific groups of menus used for checking ALARMS, for VIEWING information, or to SET setpoint values. The SCROLL mode allows the user to move about the matrix (from one menu to another, one at a time) by using the four ARROW keys. A typical menu screen is shown in Figure 31.

Pressing the MENU key from any menu screen will automatically return you to the MENU mode as shown in Figure 30.

Figure 31, Display in the Shortcut (SCROLL) Mode and Keypad Layout



Menu Screens

The menus are shown in the controller display. Each menu screen shows specific information; in some cases menus are used only to *view* the status of the unit, in some cases they are used for checking and clearing *alarms*, and in some cases they are used to *set* setpoint values.

The ARROW keys on the controller can be used to navigate through the menus. The keys are also used to change numerical setpoint values contained in certain menus.

Figure 32, Menu Matrix

"**MENU**"						
"**VIEW**" MENUS						
VIEW UNIT STATUS (1)	VIEW UNIT TEMP (1)	VIEW CIR #1 STATUS (1)	VIEW CIR #2 STATUS (1)	VIEW REFRIG CIR #1 STATUS (1)	VIEW REFRIG CIR #2 STATUS (1)	VIEW FAN S (1)
⇓	VIEW UNIT TEMP (2)	⇓	⇓	⇓	⇓	⇓
VIEW UNIT STATUS (5)		VIEW CIR #1 STATUS (4)	VIEW CIR #2 STATUS (4)	VIEW REFRIG CIR #1 STATUS (3)	VIEW REFRIG CIR #2 STATUS (2)	VIEW FAN S (3)

⇐ Continued ⇐

(Right side of matrix continued from above)

"**ALARM**" MENUS		"**SET**" MENUS				
ALARM LOG (LAST) TYPE, TIME	ACTIVE ALARM (1) TYPE, TIME	SET UNIT SPs, (1)	SET COMP SPs (1)	SET ALARM LIMITS (1)	SET FANS SP(1)	TEST UNIT (1)
ALARM LOG (NEXT TO LAST)	ACTIVE ALARM (2) TYPE, TIME	⇓	SET COMP SPs (2)	⇓	⇓	⇓
ALARM LOG LAST 25 SHOWN ⇓	ACTIVE ALARM (n) CLEAR/VIEW	SET UNIT SPs, (13)		SET ALARM LIMITS (4)	SET FANS SP (3)	TEST UNIT (6)

Menu Structure (Hierarchical)

As discussed previously, a hierarchical menu structure can be used to access the various screens. One to twenty-five levels can be used below the top-level menu, with two or three being typical. Optionally, the last menu selection can access one of a set of screens that can be navigated with the UP/DOWN ARROW keys (see the scrolled menu structure below).

Menu selection is initiated by pressing the MENU key that changes the display from a regular data screen to a menu screen. Menu selections are then made using the arrow keys according to labels on the right side of the display (the arrows are ignored). When the last menu item is selected, the display changes to the selected data screen. An example follows showing the selection of the "VIEW COMPRESSOR" (n) screen.

Suppose the initial screen is as below or any other menu screen:

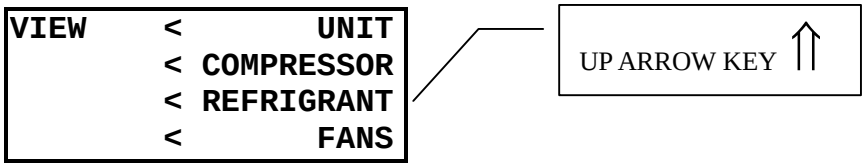
```
ALARM LOG
     (data)
     (data)
     (data)
```

After pressing the MENU key, the top level menu screen will show:

```
          < ALARM
          <  VIEW
          <   SET
```

RIGHT ARROW KEY ⇒

After pressing the “VIEW” menu key, a menu screen will show:



Selection of any of these will advance to the appropriate data menu. For example, after pressing the “**REFRIGERANT**” menu button, the selected data screen will show:

```
VIEW REFRIG
          PSI    °F
SAT EVAP XXX.X  XX.X
SAT COND XXX.X  XX.X
```

The ARROW keys will automatically return to the “scroll” mode at this time.

Screen Definitions:

This section contains information on each menu screen. The menu screens are in order of the matrix in Figure 32, going from left to right and then down when there are sub-menus. Many menus are self-explanatory.

View Menus

View Unit Status

```
VIEW UNIT STATUS (1)
Off:Unit Switch
Cool Stage=0
Evap Pump=Off
```

Unit states can be OFF, AUTO, and ALARM as determined by the authority: Switch, Remote, etc.

```
VIEW UNIT STATUS (2)
Demand Limit= Stg X
Network Limit=Stg X
```

```
VIEW UNIT STATUS (3)
Stg Up Delay=XXXXsec
Stg Dn Delay=XXXXsec
Ice Delay=   XXh XXm
```

Ice Delay only appears when in the ICE mode.

```
VIEW UNIT STATUS (4)
D.O.      111111111
 123456789012345678
 111111111111111111
```

This menu gives the status of digital outputs (D.O.), 1=ON, 0=OFF. Numbers are 1 through 18. See Table 40, Digital Outputs, on page 59 for number reference.

```
VIEW UNIT STATUS (5)
D.I.      111111111
 123456789012345678
 111111111111111111
```

This menu gives the status of digital inputs (D.I.). 1=ON, 0=OFF. Numbers are 1 through 18. See Table 39, Digital Inputs, on page 59 for number reference.

```
VIEW UNIT STATUS (6)
   Analog Outputs
   (volts X 100)
1=XXX.X   2=XXX.X
```

This menu give the output voltage for fans #1 and #2 optional VFD. Divide by 100 for actual voltage.

View Unit Temperatures

```
VIEW UNIT TEMP   (1)
Evap LWT =  XXX.X °F
OAT = XXX.X °F
LWT Target = XX.X °F
```

OAT = Outside Air Temperature.

```
VIEW UNIT TEMP   (2)
LWT Pulldn=XX.X °F/m
Control Band=XX.X °F
```

View Circuit Status

The following four screens are duplicated for circuit # 2. Units with two compressors per circuit (AGZ 026 through AGZ 090) will not have screen #4 present. Circuit 1 has compressor #1, #3, (#5), circuit 2 has compressor #2, #4, (#6).

```
VIEW CIR1 STATUS (1)
Off:Pumpdown Switch
```

```
VIEW CIR1 STATUS (2)
Comp1=Off
Hours= XXXXX
Starts= XXXXX
```

```
VIEW CIR1 STATUS (3)
Comp3=Off
Hours= XXXXX
Starts= XXXXX
```

```
VIEW CIR1 STATUS (4)
Comp5=Off
Hours= XXXXX
Starts= XXXXX
```

View Refrigerant Screens

The following three screens are duplicated for circuit #2:

```
VIEW REFRG CIR 1 (1)
Evap Press= XXX.Xpsi
Cond Press= XXX.Xpsi
```

```
VIEW REFRG CIR 1 (2)
Sat Evap= XXX.X °F
Sat Cond= XXX.X °F
VFD Target= XXX.X °F
```

```
VIEW REFRG CIR 1 (3)
Suct Temp= XXX.X °F
Superheat= XXX.X °F
Evap Appr= XX.X °F
```

Evap Appr (evaporator approach) is the difference between the leaving fluid temperature and the saturated evaporator temperature. It is an indication of the evaporator efficiency; an increasing approach temperature indicates decreasing heat transfer efficiency, at the same load point.

View Fan Screens

```
VIEW FANS          (1)
  Fans On  VFD Speed
Cir 1= X     XXX.X%
Cir 2= X     XXX.X%
```

```
VIEW FANS          (2)
Stg Error  Up   Down
Cir 1=     XXX  XXX
Cir 2=     XXX  XXX
```

```
VIEW FANS          (3)
Sat Cond
 Target= XXX.X°F
```

See explanation of fan operation on page 68.

ALARM MENUS

Alarm Log

```
Alarm Log          (X)
Alarm Description
Time/Date
Data:Edit and scroll
```

The last 25 alarms, either shutdown or limit, are shown in this menu with earlier alarm menus stored under it. ARROW DOWN from this menu will go to the next-to-last alarm, ARROW DOWN again will go to the second from last, and so on through the last 25 occurrences. The screens are numbered (1), (2), (3),....(X).

Active Alarm

```
Alarm Active
Alarm Description
Time/Date
```

.

```
Alarm Active
No more alarms
Press ENTER to clear
   all active alarms
```

If the unit is off on a shutdown alarm, or running but in a limit alarm condition, the cause, date/time, and UNIT STATUS will appear in the ALARM ACTIVE screen. The remote alarm relay will close, and a red light will appear behind the LEFT button. The light will go out when the fault is cleared. If there is a simultaneous occurrence of more than one alarm, the others will appear in additional screens below this one, accessed by the DOWN ARROW.

If an alarm occurs, press the MENU button, then the LEFT button for ALARM, and then the left button again to reach the ALARM ACTIVE screen.

The cause of the alarm must be remedied before attempting to clear the alarm. To clear the alarm(s), scroll down to the last screen (bottom screen above) and press ENTER. The SET UNIT SPs screen will appear and the password will be asked for. Press ENTER and the cursor will flash in the password field. Press the UP button to scroll the numbers up to the required password. Press ENTER to enter the password. Then return to the ALARM ACTIVE screen and press ENTER to clear the alarm.

If other faults have appeared, they will all be cleared at the same time.

SET MENUS

Changing setpoints; setpoints are changed as follows:

1. A password must be entered before attempting to change any setpoint. Two four-digit passwords provide OPERATOR and MANAGER levels of access to setpoints. The passwords are preprogrammed into the controller. The Operator Password is 0100, the Manager Password is 2001. Either password must be entered using the ENTER PASSWORD screen (15) before a protected setting can be changed. The quickest way to reach screen (15) is to press the MENU key, then press SET (UP Arrow Key), then press the UP Arrow key, which will go to screen (15). Press ENTER to reach the numerical field, hold the UP Arrow key to scroll the numbers up to the desired password, then press ENTER. The word “Operator” or “Manager” will appear next

to Level when the password is entered properly. Setpoints can now be changed. Once entered, a password remains valid for 15 minutes after the last key-press.

2. Select the desired menu by scrolling through SET menus with the UP, DOWN, LEFT and RIGHT ARROWS. Alternatively, press the MENU button, select the type of setpoint desired, then scroll up or down to the desired menu screen.
3. When the desired menu screen is reached, select the desired field within the menu by moving between lines using the ENTER key. Some fields may not be accessible due to settings in other menus.
4. If a numerical value is being changed, use the INCREMENT key (UP ARROW) to increase or the DECREMENT key (DOWN ARROW) to decrease the value of the setpoint.
5. If a word type setpoint (for example, YES or NO) is to be selected, the choices are pre-loaded into the menu and selected by scrolling through the available setpoint options using the UP ARROW key.
6. Enter the desired value or word into the controller by pressing the ENTER key. Note that pressing <D will go to the factory default setting.

Stated another way, once the desired set screen is reached, editing is accomplished by pressing the ENTER key until the desired field is selected within the set screen. This field is indicated by the cursor blinking on it. The arrow keys will then operate as defined below.

<D DEFAULT..... Set value to original factory setting
<C CANCEL ..... Not currently operative
<+ INCREMENT..... Increase the value or select the next item in a list.
<– DECREMENT.... Decrease the value or select the previous item in a list.

During edit mode, the display shows a two-character-wide menu pane on the right as shown below. These characters relate to the functions shown above. After a field has been set to the desired new values, press ENTER. This enters the value and scrolls to the next field.

```
SET UNIT SPs (X)  <D
     (data)       <C
     (data)       <+
     (data)       <-
```

Additional fields can be edited by pressing the ENTER key until the desired field is selected.

Unit Setpoints

```
SET UNIT SPs (1)
Unit Enable=OFF
Mode=COOL
Source=KEYPAD
```

Unit Enable is an external signal, or a keypad setting, that keeps the unit off when the setting is OFF, and *allows* it to run if there is a call for cooling when the setting is ON. The source for the signal is selected in the 4th line and can be:

1. KEYPAD, in which case the selection is made in line 2 and would normally be selected as ON. This is the normal setting when no external signals are controlling the unit.
2. DIGITAL INPUT, in which an external switch is wired across terminals #25 and #35. (See wiring diagram page 48).
3. BAS, used with BAS signal.

Unit Mode settings can be:

1. COOL, normal setting used with chilled water air-condition applications.
2. COOL w/GLYCOL, used with low temperature glycol applications. It allows a lower LWT setpoint to be used.
3. ICE w/GLYCOL, used with ice storage systems, allows changing from chilled glycol operation to lower temperature ICE operation. In ICE, the unit runs at full load until the ICE setpoint is reached, at which time the unit shuts off. A three-position switch wired to terminals #28 and #38 initiates the change from glycol cooling to making ice. (See wiring diagram on page 48.)
4. TEST, for use by service technician for certain test procedures.

```
SET UNIT SPs (2)
Available Modes
  =COOL w/Glycol
Set w/ FP Switch Off
```

Available Modes settings can be COOL, COOL w/Glycol, ICE w/Glycol, or TEST as selected from the available modes imbedded in the menu. The 4th line is a reminder that the ON/OFF switch on the front panel (FP) must be in the OFF position before the MODE can be changed. This prevents a mode change while the unit is operating.

```
SET UNIT SPs (3)
Evap LWT =  XX.X°F
Ice LWT =  XX.X°F
```

```
SET UNIT SPs (4)
EvapDeltaT= XX.X°F
StartDelta= XX.X°F
Stop Delta = XX.X°F
```

See the Compressor Control section beginning on page 64 for explanation.

```
SET UNIT SPs     (5)
Max Pulldn=X.X°F/min
Evap Recirc=XXX sec
LowAmbLock= XX.X°F
```

```
SET UNIT SPs     (6)
Demand Limit=No
Multipoint Power=No
```

```
SET UNIT SPs (7)
       CLOCK
     dd/mmm/yyyy
       hh:mm:weekday
```

```
SET UNIT SPs (8)
Units = °F/psi
Lang  = ENGLISH
```

Units settings are only °F/psi at the present time. °C/kPa will be available later.
Lang (Language) settings can be only ENGLISH at present.

```
SET UNIT SPs (9)
Protocol = MODBUS
Ident Number=001
Baud Rate=9600
```

Ident Number and Baud Rate are in effect when BAS is selected in the SET screen.

```
SET UNIT SPs    (10)
Evap Pressure Sensor
Cir1 Offset= XX.Xpsi
Cir2 Offset= XX.Xpsi
```

The pressure offsets on menus 10 and 11 and the temperature offsets on menus 12, 13 and 14 correct the controller's display of the parameters. The sensors used in these units have a high degree of repeatability but may need initial correction (offset). An accurate pressure gauge or thermometer is used to determine the correct temperature or pressure. A positive or negative offset value is then entered to make the controller reading agree with the measured value.

```
SET UNIT SPs    (11)
Cond Pressure Sensor
Cir1 Offset= XX.Xpsi
Cir2 Offset= XX.Xpsi
```

```
SET UNIT SPs    (12)
Suction Temp Sensor
Cir 1 Offset= XX.X °F
Cir 2 Offset= XX.X °F
```

```
SET UNIT SPs    (13)
Leaving Evaporator
Water Temp Sensor
Offset= XX.X °F
```

```
SET UNIT SPs    (14)
Outside Ambient
Temperature Sensor
Offset= XX.X °F
```

```
SET UNIT SPs (15)
ENTER PASSWORD XXXX
Active Password
Level:None
```

Set Comp Setpoints

```
SET COMP SPs (1)
# of Compressors =X
Stop-Start  =XXmin
Start-Start =XXmin
```

This menu sets the anti-recycle timers. Stop-Start is the time required before starting a compressor after it has *stopped*. Start-Start is the time required before starting a compressor after the last time it has *started*. It is recommended that these default values not be changed.

```
SET COMP SPs (2)
InterStageUp=XXXsec
InterStageDn=XXXsec
Clear Cycle Tmrs =no
```

InterStageUp is the time delay since the last stage change before a compressor can stage on.

InterStageDn is the time delay since the last stage change before a compressor can stage off normally (not by an alarm).

Limit Alarms

```
SET ALARM LMTS (1)
LowEvPrHold=XXXpsi
LowEvPrUnld=XXXpsi
```

The LowEvPrHold and LowEvPrUnld have the same default value of 59 psi. If two compressors are running, the LowEvPrUnld is in effect and the lag compressor will be shut off to unload the unit. If one compressor is running, the LowEvPrHold is in effect and the lag compressor is prevented from starting, thereby holding the unit capacity.

```
SET ALARM LMTS (2)
Evap Freeze= XX.X°F
EvapFlowProof=XXXsec
```

Evap Freeze (the unit freeze protection shutdown) is actually a stop alarm and shuts off the unit when the LWT reaches 36°F. It is cleared by going to the CLEAR ALARM menu in the ACTIVE ALARM hierarchy.

EvapFlowProof is a time delay on the flow switch trip that reduces nuisance low flow trips. The default setting is 5 seconds.

```
SET ALARM LMTS (3)
HighCondPr = XXXpsi
HiCondStgDn = XXXpsi
```

HighCondPr (the unit high-discharge-pressure shutdown) is a stop alarm that shuts off the unit when the discharge pressure reaches the setting. The default setting is 385 psi. The HiCondStDn is a limit alarm that unloads the unit in an attempt to prevent total shutdown from the HighCondPr. The stage down is set at 370 psi.

```
SET ALARM LMTS (4)
PhaseVoltage=YES/NO
GroundFault=YES/NO
```

Fan Stages

```
SET FANS SPs (1)
Number of Fans = X
Fan VFD = YES/NO
```

The Number of Fans line tells the controller the number of fans on the unit. The UP ARROW toggles between 4, 6 and 8.

Fan VFD tells the controller whether the optional low ambient fan VFD is installed in the unit. The UP ARROW toggles between YES and NO. The setting changes the range available: YES = -2°F to 60°F, NO = 35°F to 60°F.

```
SET FANS SPs     (2)
Stg Up Deadband(°F)
  Stg2  Stg3  Stg4
  XX.X  XX.X  XX.X
```

```
SET FANS SPs     (3)
Stg Dn Deadband(°F)
Stg0 Stg1 Stg2 Stg3
XX.X XX.X XX.X XX.X
```

```
SET FANS SPs     (4)
VFD Min Speed=  XX%
VFD Max Speed= XXX%
```

```
SET FANS SPs     (5)
Cond Sat Temp Target
Setpoint= XXX.X °F
```

```
SET FANS SPs     (6)
# Fans On At Startup
 >75°F >90°F >105°F
    1     2     3
```

TEST MENUS

The field test screens are only available when the unit is in TEST mode. Using these screens, any digital output can be controlled manually.

```
TEST UNIT        (1)
Alarm Signal=Off
EvapWaterPump=Off
```

```
TEST UNIT        (2)
Liq Line Sol 1=Off
Compressor  HG1=Off
1=Off 3=Off 5=Off
```

```
TEST UNIT        (3)
Liq Line Sol 2=Off
Compressor  HG2=Off
2=Off 4=Off 6=Off
```

```
TEST UNIT        (4)
Fan 1= Off
Fan 3= Off
Fan 5/7= Off
```

```
TEST UNIT        (5)
Fan 2= Off
Fan 4= Off
Fan 6/8= Off
```

```
TEST UNIT        (6)
Fan VFD 1= 000.0%
Fan VFD 2= 000.0%
```

ACZ Microtech II™ Controller

Software Version ACZD20101A

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Overview

The MicroTech II controller's state-of-the-art design not only permits the condensing unit to run more efficiently, but also simplifies troubleshooting if a system failure occurs. Every MicroTech II controller is programmed and tested prior to shipment to facilitate start-up.

Operator-friendly

The MicroTech II controller menu structure is separated into three distinct categories that provide the operator or service technician with a 1) full description of current unit status, 2) control parameters, and 3) alarms. Security protection prevents unauthorized changing of the setpoints and control parameters.

The MicroTech II control continuously performs self-diagnostic checks, monitoring system temperatures, pressures and protection devices, and will automatically shut down a compressor or the entire unit should a fault occur. The cause of the shutdown will be retained in memory and can be easily displayed in plain English for operator review. The MicroTech II chiller controller will also retain and display the date/time that the fault occurred. In addition to displaying alarm diagnostics, the MicroTech II controller also provides the operator with a warning of limit (pre-alarm) conditions.

ACZ-B Inputs/Outputs

Table 47, Analog Inputs

#	Description	Type	Signal Source	Range
1	Evaporator Refrigerant Pressure #1	C1	0.1 to 0.9 VDC	0 to 132 psi
2	Evaporator Refrigerant Pressure #2	C2	0.1 to 0.9 VDC	0 to 132 psi
3	Condenser Refrigerant Pressure #1	C1	0.1 to 0.9 VDC	3.6 to 410 psi
4	Open			
5	Outside Ambient Temperature	UT	NTC Thermister (10k@25°C)	-58 to 212°F
6	Condenser Refrigerant Pressure #2	C2	0.1 to 0.9 VDC	3.6 to 410 psi
7	Open			
8	Demand Limit	UT	4-20 mA Current	0-100 % Load
9	Open			
10	Open			

NOTE: C1 = Refrigerant Circuit #1, C2 = Refrigerant Circuit #2, UT = Unit

Table 48. Analog Outputs

#	Description	Output Signal	Range
1	Fan #1 VFD	0 to 10 VDC	20 to 60 Hz
2	Fan #2 VFD	0 to 10 VDC	20 to 60 Hz
3	Open		
4	Open		
5	Open		
6	Open		

Table 49, Digital Inputs

#	Description	Type	Signal	Signal
1	Unit Switch	UT	0 VAC (Stop)	24 VAC (Auto)
2	Pump Down Switch #1	C1	0 VAC (Stop)	24 VAC (Start)
3	Evaporator Flow Switch	UT	0 VAC (No Flow)	24 VAC (Flow)
4	Stage #1	C1	0 VAC (Off)	24 VAC (On)
5	Stage #2	C2	0 VAC (Off)	24 VAC (On)
6	Pump Down Switch #2	C2	0 VAC (Stop)	24 VAC (Start)
7	Stage #3	C1	0 VAC (Off)	24 VAC (On)
8	Stage #4	C2	0 VAC (Off)	24 VAC (On)
9	Phase Voltage Fault #1 (See Note 1 Below)	C1	0 VAC (Fault)	24 VAC (No Fault)
10	Phase Voltage Fault #2 (See Note 1 Below)	C2	0 VAC (Fault)	24 VAC (No Fault)
11	Ground Fault Prot. #1 (See Note 2 Below)	C1	0 VAC (Fault)	24 VAC (No Fault)
12	Ground Fault Prot. #2 (See Note 2 Below)	C2	0 VAC (Fault)	24 VAC (No Fault)
13	Remote Start/Stop	UT	0 VAC (Stop)	24 VAC (Start)
14	Stage #5	C1	0 VAC (Off)	24 VAC (On)
15	Mechanical High Pressure #1	C2	0 VAC (High Pressure/Off)	24 VAC (OK)
16	Mechanical High Pressure #2	C2	0 VAC (High Pressure/Off)	24 VAC (OK)
17	Stage #6	C2	0 VAC (Off)	24 VAC (On)
18	Open			

NOTES:

1. C1 = Refrigerant Circuit #1, C2 = Refrigerant Circuit #2, UT = Unit
2. See Safety Alarms Table for “Phase Voltage Protection”. Units with single point electrical connection will have one PVM with Inputs 9 and 10 wired together. Units with multiple point connection will have two PVM’s with Input 9 for Electrical Circuit #1 and Input 10 for Electrical Circuit #2.
3. See Safety Alarms Table for “Ground Fault Protection”. Units with single point electrical connection will have one GFP with Inputs 11 and 12 wired together. Units with multiple point connection will have two GFP’s with Input 11 for Electrical Circuit #1 and Input 12 for Electrical Circuit #2.

Table 50, Digital Outputs

#	Description	Type	Load	Output OFF	Output ON
1	Alarm	C1,C2, UT	Alarm Indicator	Alarm OFF	Alarm ON
2	Evaporator Fan Relay	UT	Pump Contactor	Pump OFF	Pump ON
3	Motor Control Relay #1 = Compr#1	C1	Starter	Compressor OFF	Compressor ON
4	Motor Control Relay #2 = Compr#2	C2	Starter	Compressor OFF	Compressor ON
5	Motor Control Relay #3 = Compr#3	C1	Starter	Compressor OFF	Compressor ON
6	Motor Control Relay #4 = Compr#4	C2	Starter	Compressor OFF	Compressor ON
7	Liquid Line #1	C1	Solenoid	Cooling OFF	Cooling ON
8	Motor Control Relay #5 = Compr#5	C1	Starter	Compressor OFF	Compressor ON
9	Motor Control Relay #6 = Compr#6	C2	Starter	Compressor OFF	Compressor ON
10	Condenser Fan #1	C1	Fan Contactor	Fan OFF	Fan ON
11	Condenser Fan #2	C2	Fan Contactor	Fan OFF	Fan ON
12	Liquid Line #2	C2	Solenoid	Cooling OFF	Cooling ON
13	Condenser Fan #3	C1	Fan Contactor	Fan OFF	Fan ON
14	Hot Gas Bypass #1	C1	Solenoid	Cooling OFF	Cooling ON
15	Hot Gas Bypass #2	C2	Solenoid	Cooling OFF	Cooling ON
16	Condenser Fan #4	C2	Fan Contactor	Fan OFF	Fan ON
17	Condenser Fan #5 (&#7–8 Fans Only)	C1	Fan Contactor	Fan OFF	Fan ON
18	Condenser Fan #6 (&#8–8 Fans Only)	C2	Fan Contactor	Fan OFF	Fan ON

Setpoints

The following parameters are remembered during power off, are factory set to the **Default** value, and can be adjusted to any value in the **Range** column. The PW (password) column indicates the password that must be active in order to change the setpoint. Password codes are as follows:

O = Operator 0100
M = Manager 2001

Table 51, Setpoints

Description	Default	Range	PW
Unit			
Unit Enable	OFF	OFF, ON	O
Control source	DIGITAL INPUT	KEYPAD, BAS, DIGITAL INPUT	O
Available Modes	COOL	COOL TEST	M
** Display Units			
** Language			
Protocol	Modbus	BACnet, LonWorks, MODBUS	M
Ident number (Modbus only)	001	001-999	M
Baud rate (Modbus only)	9600	1200,2400,4800,9600,19200	M
Low Ambient Lockout	35 °F	–2(35) to 60 °F	M
Demand Limit	No	No,Yes	M
* Multipoint Power	No	No,Yes	M
Compressor			
* Number of Compressors	4	4,6	M
Stage Up Delay	120	90 to 240 sec	M
Stage Down Delay	30	20 to 60 sec	M
Start-Start	15 min	10 to 60 min	M
Stop-Start	5 min	3 to 20 min	M
Clear Cycle Timers	No	No,Yes	M
Alarms			
Low Evap Pressure-Hold	59 psi	31 to 65 psi	M
Low Evap Pressure-Unload	59 psi	31 to 65 psi	M
High Condenser Stage Down	370 psi	365 to 380 psi	M
High Condenser Pressure	385 psi	385 to 390 psi	M
* Phase Voltage Protection	No	No,Yes	M
* Ground Fault Protection	No	No,Yes	M
Evap Flow Proof	5 sec	3 to 30 sec	M
Condenser Fans			
VFD Enable	No	No,Yes	M
* Number of Fans	4	4,6,8	M
Stage 2 On Deadband	8	1 to 20 °F	M
Stage 3 On Deadband	11	1 to 20 °F	M
Stage 4 On Deadband	14	1 to 20 °F	M
Stage 2 Off Deadband	7	1 to 20 °F	M
Stage 3 Off Deadband	6	1 to 20 °F	M
Stage 4 Off Deadband	5	1 to 20 °F	M
VFD Max Speed	100%	90 to 110%	M
VFD Min Speed	25%	25 to 100%	M
Sat Condenser Temp Target	110	90 to 130 °F	M
Forced Fan 1	1	1 to # Fans Per Circuit	M
Forced Fan 2	2	1 to # Fans Per Circuit	M
Forced Fan 3	3	1 to # Fans Per Circuit	M

* Set at factory prior to shipment
** Not currently selectable

Automatic Adjusted Ranges

The following are setpoints that are limited based on the option selected.

Table 52, Low Ambient Lockout Temperature

VFD	Range
VFD = N	35 – 60°F
VFD = Y	-2 – 60°F

Table 53, Forced Fan 1,2,3

Number of fans	Range
4	1 – 2 fans
6	1 – 3 fans
8	1 – 4 fans

Table 54, Forced Fan Stage Defaults

	Number of Fans Setpoint		
	4	6	8
Forced Fan 1	1	1	1
Forced Fan 2	1	1	2
Forced Fan 3	2	2	3

When the number of fans setting is changed, the forced fan setpoints will default to values as shown in the above table.

Shutdown Alarms

Shutdown alarms (also know as "Stop Alarms" or "Safeties") execute rapid compressor shutdown and require manual reset. They are also logged in the Alarm Log.

The following table identifies each shutdown alarm, gives the condition that causes the alarm to occur, and states the action taken because of the alarm. If the alarm is auto-clearing, the reset condition is shown below. Otherwise, the alarm is manually reset, requiring the operator to clear the alarm. All shutdown alarms do the following while active:

Appear in the active alarm menu
Activate the alarm output NO1
Light the alarm signal on the controller
Log the alarm in the Alarm Log.

Table 55, Shutdown Alarms

Description	Occurs When:	Action Taken	Reset
No Evaporator Flow	Evap Fan State = RUN AND Evap Flow Digital Input = No Flow for time > Evap Flow Proof SP	Rapid Stop Unit	Manual
Low Evaporator Pressure	Evaporator Press < Low Evap Pressure SP for time > Low Evap Pressure Delay SP	Rapid Stop Circuit	Manual
High Condenser Pressure	Condenser Press > High Condenser Pressure SP	Rapid Stop Circuit	Manual
Mechanical High Condenser Pressure/Motor Protect	Digital Input = Off On Power Up: Delay 150 Sec. before checking	Rapid Stop Circuit	Manual
Phase Voltage Protection (opt.)	If Phase Voltage Protection = Y, Then Digital Input Off= Phase/Voltage Problem	Rapid Stop Circuit	Phase/Voltage Input returns to normal
Ground Fault Protection (opt.)	If Phase Voltage Protection = Y, Then Digital Input Off= Phase/Voltage Problem	Rapid Stop Circuit	Manual
Low Ambient Re-Start Fault	Failed low ambient start for third consecutive time	Rapid Stop Circuit	Manual
Evaporator Pressure Sensor Fault	Sensor shorted or open	Rapid Stop Circuit	Manual
Condenser Pressure Sensor Fault	Sensor shorted or open	Rapid Stop Circuit	Manual
Outside Ambient Temp. Sensor Fault	Sensor shorted or open	Normal Stop Unit	Manual

Events (Limit Alarms)

The following alarms do not cause a rapid shutdown, but limit operation of the chiller in some way as described in the Action Taken column. All limit alarms do the following while active:

- Appear in the active alarm menu
- Light the alarm signal on the controller
- Log the alarm in the Alarm Log.

Table 56, Limit Alarms

Description	Occurs When:	Action Taken	Reset	
High Condenser Pressure Stage Down	Any Comp on Circuit Running AND Pressure > High Condenser Stage Down setpoint	Stage off one compressor on the circuit	Condenser Press drops below (SP – 100psi) AND OAT drops 5°F	CT
Low Evaporator Pressure – Hold	One Comp Running on Circuit AND Pressure < Low Evap Pressure– Hold setpoint	Inhibit staging on of additional compressors on the circuit	Evap Press rises above (SP + 8psi)	CT
Low Evaporator Pressure – Unload	Both Comp Running on Circuit AND Pressure < Low Evap Pressure– Unload setpoint	Stage off one compressor on the circuit	Evap Press rises above (SP + 10 psi + Stage Up Delta T)	CT
Can't Pumpdown	Circuit State = Pumpdown for more than 60 sec	Shut off circuit	Circuit shutdown	CT

NOTE: UT = entire Unit (Both Circuits), CT = that Circuit Only

Logging

When a shutdown or limit alarm occurs, the description, date, and time are stored in the active alarm buffer corresponding to that alarm (viewed on the Alarm Active screens), and also in the alarm history buffer (viewed on the Alarm Log screens). The active alarm buffers hold a record of all current alarms. The active alarms can be cleared by pressing the Edit (Enter) key when the end of the list has been reached by scrolling. Active alarms may only be cleared after the appropriate password level is active.

A separate alarm log stores the last 25 alarms and events to occur. When an alarm or event occurs, it is put into the first slot in the alarm log and all others are moved down one, dropping the last entry. The alarm log stores the date and time of the occurrence, as well as a list of other parameters. These include unit state and OAT for all alarms. If the alarm is a circuit alarm, then the circuit state, refrigerant pressures and temperatures, and number of fans on are also stored. The parameters may be accessed by scrolling to the last line on the alarm log screen (similar to a setpoint).

Control Logic

Unit Enable

Enabling and disabling the chiller is controlled by the Unit Enable Setpoint with options of OFF and ON. This setpoint can be altered by the Unit OFF input, Remote input, Keypad entry, and BAS request. The Control Source SetPoint determines which sources can change the Unit Enable Setpoint with options of SWITCHES, KEYPAD or NETWORK (BAS).

Changing the Unit Enable Setpoint can be accomplished according to the following table.

Table 57, Unit Enable Conditions

Unit Off Input	Control Source Setpoint	Remote Input	Keypad Entry	BAS Request	Unit Enable
OFF	x	x	x	x	OFF
x	SWITCHES	OFF	x	x	OFF
ON	SWITCHES	ON	x	x	ON
ON	KEYPAD	x	OFF	x	OFF
ON	KEYPAD	x	ON	x	ON
ON	NETWORK	x	x	OFF	OFF
ON	NETWORK	OFF	x	x	OFF
ON	NETWORK	ON	x	ON	ON

NOTE: An "x" indicates that the value is ignored.

Unit Mode Selection

The operating mode of the condensing unit is set by the Available Mode Setpoint with options of COOL and TEST. COOL mode is the standard mode of operation. TEST is a field test mode, accessible only with the manager password. The unit test mode allows manual control of each digital output.

Unit Test Mode

The unit test mode allows manual testing of controller outputs. Entering this mode requires the following conditions:

- Unit OFF input = OFF (i.e., the entire chiller is shut down).
- Manager password active.
- Available Unit Mode setpoint = TEST

A test menu can then be selected to allow activation of the outputs. It is possible to switch each digital output ON or OFF and set the analog outputs to any value.

When in test mode, the compressors may be turned on, but they will automatically shut off after 10 seconds.

Compressor Control

Compressor Sequencing

This section defines which compressor is the next one to start or stop. The next section defines when the start, or stop, is to occur.

Compressor sequencing is based primarily on compressor run-hours and starts. Compressors with fewer starts will start before those with more starts. Compressors that have more run-hours will shut off before those with less run-hours. In the event of a tie on number of starts, the lower numbered compressor starts first. In the event of a tie on run-hours, the lower numbered compressor shuts off first.

If possible, the number of running compressors on each circuit will be balanced. If a circuit is unavailable for any reason, the other circuit is allowed to stage on all compressors.

Required Parameters

1. Number of starts for all compressors
2. Number of run hours for all compressors
3. Status of all compressors (Available/Unavailable)
4. Compressor number

Compressor Start/Stop Timing

This section defines when a compressor is to start, or stop, and the scenario for doing so.

Required Parameters

1. Number of Compressors/Circuit setpoint
2. Number of compressors running
3. Interstage timer status
4. Stage request input status

Stage Up

IF [Stage Request > Number of Compressors Running

AND Stage Up Timer Expired]

THEN Stage_Up_Now = YES

Stage Down

IF [Stage Request < Number of Compressors Running

AND Stage Down Timer Expires]

THEN Stage_Down_Now = YES

Circuit Capacity Overrides – Limits of Operation

The following conditions shall override the automatic capacity control when the unit is in the COOL mode. These overrides keep a circuit from entering a condition in which it is not designed to run.

Low Evaporator Pressure

If a circuit is running and the evaporator pressure drops below the Low Evaporator Pressure-Hold setpoint, no more compressors will be allowed to start on that circuit. This limit shall be active until the evaporator pressure reaches the hold setpoint plus 8 psi.

If a circuit is running with two or three compressors on and the evaporator pressure drops below the Low Evaporator Pressure-Unload setpoint, the circuit will begin reducing capacity. If two compressors are running, one of the running compressors will be stopped. If three compressors are running, then one compressor will be stopped initially. Ten seconds later, if the pressure has not risen above the unload setpoint, another compressor will be stopped. The last compressor on a circuit will not stop due to the unload condition.

High Condenser Pressure

If the discharge pressure rises above the High Condenser Pressure Unload setpoint and more than one compressor on the circuit is running, the circuit will stage down. One compressor will shutdown as soon as the pressure rises above the unload setpoint, and if two remain running, then one more will shut down 10 seconds later if the pressure is still above the unload setpoint. No stage up will be allowed on the circuit until the condenser pressure drops to the unload setpoint less 100 psi, and the outdoor ambient temperature drops 5 degrees F.

Low Ambient Lockout

If the OAT drops below the low ambient lockout setpoint, then all running circuits will do a normal stop. Once the lockout has been triggered, no compressors will start until the OAT rises to the lockout setpoint plus 5 degrees F.

High Ambient Limit

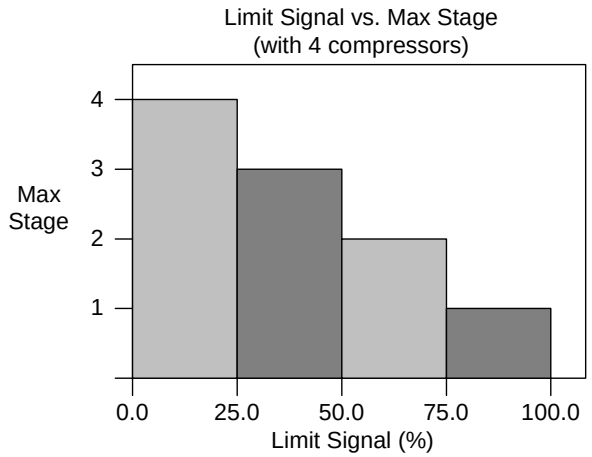
On units not configured with multi-point power connections, the maximum load amps could be exceeded at high ambient temperatures. If all circuit 1 compressors are running or all but one compressor on circuit 1, power connection is single point, and the OAT is greater than 116°F, circuit 2 is limited to running all but one compressor. The circuit 2 status will indicate if this is the case. This action will allow the unit to operate at higher temperatures than 116°F.

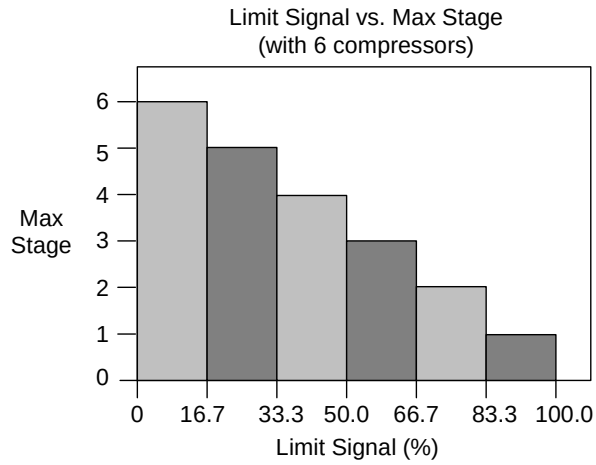
Unit Capacity Overrides

The following conditions override the automatic capacity control when the chiller is in COOL mode only.

Demand Limit

The maximum unit capacity can be limited by a 4-to-20 mA signal on the Demand Limit analog input. This function is only enabled if the Demand Limit setpoint is set to ON. The maximum unit capacity stage is determined as shown in the following graphs:





Evaporator Fan Interlock

The Evap Fan can be cycled by the controller. If the unit is enabled and at least one circuit is able to run, the controller sends a signal to start the fan (wired from terminals #33 and #35 on TB1). If air-flow is sensed from an air flow switch or auxiliary contact (wired to terminals #44 and #61 on TB1) for a settable time interval (10 second default value), the unit will be ready to start at a call for cooling. On DX air handlers, this output and input do not have to be used, in which case a jumper is required across terminals #44 and #61.

If a water chiller is used as the low side with the condensing unit, the flow switch interlock is mandatory to help avoid an evaporator freeze-up resulting from no flow. Starting and stopping the pump from the MicroTech II control is not mandatory.

Pumpdown

When a circuit reaches a condition where it needs to shut down normally, a pumpdown will be performed. All but the lowest numbered running compressor will shut off. During pumpdown, the hot gas bypass and liquid line valves are closed, while a compressor continues to run. The pumpdown is complete when the evaporator pressure is less than the low evaporator pressure unload setpoint less 15 psi, or the circuit has been in the pumpdown state for 60 seconds.

Condenser Fan Control

VFD

Condenser pressure trim control is accomplished using an optional low ambient fan VFD to control the speed of the first fan on each circuit. This VFD control uses a proportional integral function to drive the saturated condenser temperature to a target value by changing the fan speed. The target value is normally the same as the saturated condenser temperature target setpoint.

The fan VFD always starts when the saturated condenser temperature rises higher than the target.

Stage Up Compensation

In order to create a smoother transition when another fan is staged on, the VFD compensates by slowing down initially. This is accomplished by resetting the VFD target to the saturated condenser temperature at the time of the stage up. The higher target causes the VFD logic to decrease fan speed. Then, every five seconds, 0.5 degree F is subtracted from the VFD target until it is equal to the saturated condenser temperature target setpoint. This will allow the VFD to slowly bring the saturated condenser temperature back down.

Fantrol

Condenser Fans Staging is based on condenser pressure as selected by Fan Stage On & Off setpoints. Fans 1, 3, 5, and 7 are for circuit 1, and fans 2, 4, 6, and 8 are for circuit 2. Fans 1 and 2 start with the first compressor on the respective circuit when the ambient temperature is greater than 75°F. Below 75°F, these fans start when the condenser pressure reaches the stage-on setpoint. The compressor must be running in order to run any fans.

Fan Stages

There are 2, 3, or 4 fans available per circuit. On 8 fan units, fans 5/7 and 6/8 are controlled by one contactor for each pair, using virtual stages to allow a difference of only one fan between stages. See the tables below:

Table 58, Fan Staging

4 and 6 Fan Units		
Stage	**Fans On Cir 1**	**Fans On Cir 2**
1	1	2
2	1,3	2,4
3	1,3,5	2,4,6

8 Fan Units		
Stage	**Fans On Cir 1**	**Fans On Cir 2**
2	1,3	2,4
3	1,5,7	2,6,8
4	1,3,5,7	2,4,6,8

Normal Operation - Staging Up

At startup, the first fan will start when the saturated condenser temperature rises above the target. After this, the stage up deadbands apply.

When the saturated condenser temperature is above the Target + the active deadband, a Stage Up error is accumulated.

Stage Up Error Step = Saturated Condenser Refrigerant temperature – (Target + Stage Up deadband)

The Stage Up Error Step is added to Stage Up Accumulator once every Stage Up Error Delay seconds. When the Stage Up Error Accumulator is greater than the Stage Up Error Setpoint, another stage is started.

When a stage up occurs, or the saturated condenser temperature falls back within the Stage Up deadband, the Stage Up Accumulator is reset to zero.

Normal Operation - Staging Down

There are four Stage Down deadbands, one for each stage.

When the saturated condenser refrigerant temperature is below the Target – the active deadband, a Stage Down error is accumulated.

Stage Down Error Step = (Target – Stage Down deadband) – Saturated Condenser Refrigerant temperature

The Stage Down Error Step is added to Stage Down Accumulator once every Stage Down Error Delay seconds. When the Stage Down Error Accumulator is greater than the Stage Down Error Setpoint, another stage of condenser fans turns off. The last stage on will not shut off until the circuit is in an off state.

When a stage down occurs, or the saturated temperature rises back within the Stage Down deadband, the Stage Down Error Accumulator is reset to zero.

Forced Fan Stage At Start

Fans may be started simultaneously with the compressor based on outdoor ambient temperature. When the compressor starts, a Fantrol stage is forced based on the following table.

Table 59, Forced Fan at Start

OAT	Fantrol Stage At Start
> 75 ^{o}F	Forced Fan 1 SP
> 90 ^{o}F	Forced Fan 2 SP
> 105 ^{o}F	Forced Fan 3 SP

Up to four fans may be forced on when the compressor starts. If the unit has the VFD option, then only three fans can start with the compressor, and the VFD will start normally when the saturated condenser temperature is higher than the target.

After forcing fans on, the saturated condenser temperature may temporarily stay below the target by some amount. In order to keep these fans from staging off, no stage down error can be accumulated until either the OAT drops below 75^{o}F, or the saturated condenser temperature goes above the target.

Optional VFD Low Ambient Fan Control

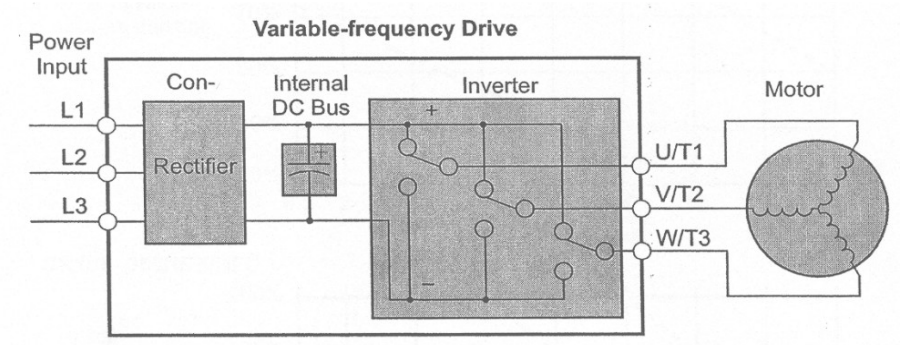
Low ambient air temperature fan control is accomplished by using the Optional Low Ambient VFD to control the speed of the first fan on each circuit. This VFD control uses a proportional integral function to drive the saturated condenser temperature to a target value by changing the fan speed. The target value is normally the same as the saturated condenser temperature target setpoint.

The fan VFD always starts when the saturated condenser temperature rises higher than the target.

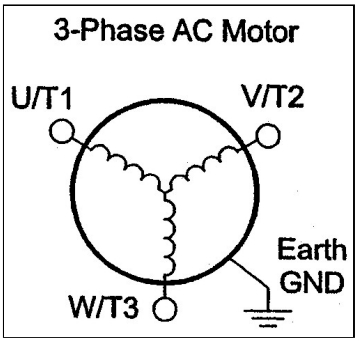
What is an Inverter?

The term inverter and variable-frequency drive are related and somewhat interchangeable. An electronic motor drive for an AC motor controls the motor's speed by varying the frequency of the power sent to the motor.

An inverter, in general, is a device that converts DC power to AC power. The figure below shows how the variable-frequency drive employs an internal inverter. The drive first converts incoming AC power to DC through a rectifier bridge, creating an internal DC bus voltage. Then the inverter circuit converts the DC back to AC again to power the motor. The special inverter can vary its output frequency and voltage according to the desired motor speed.



Inverter Output to the Motor



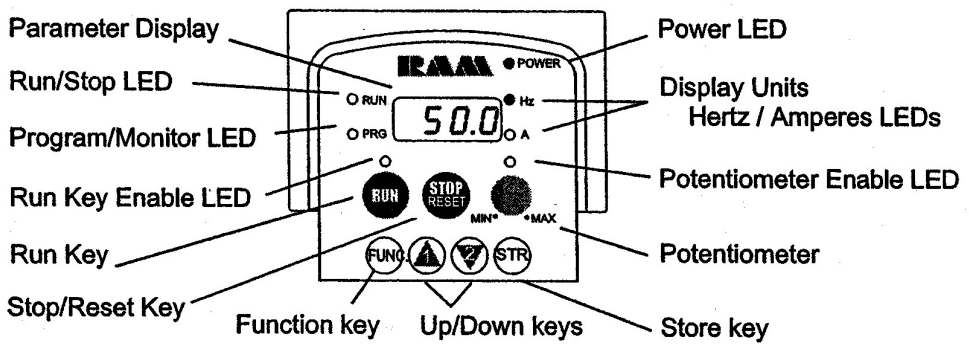
The AC motor must be connected only to the inverter's output terminals. The output terminals are uniquely labeled (to differentiate them from the input terminals) with the designations U/T1, V/T2, and W/T3. This corresponds to typical motor lead connection designations T1, T2, and T3. The consequence of swapping any two of the three connections is the reversal of the motor direction. This must not be done. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.

Notice the three connections to the motor do not include one marked "Neutral" or "Return." The motor represents a balanced "Y" impedance to the inverter, so there is no need for a separate return. In other words, each of the three "Hot" connections serves also as a return for the other connections, because of their phase relationship.

Do not to switch off power to the inverter *while the motor is running* (unless it is an emergency stop). Also, do not install or use disconnect switches in the wiring from the inverter to the motor (except thermal disconnect).

Inverter Front Panel Keypad

The CR100 Series inverter front keypad contains all the elements for both monitoring and programming parameters. The keypad layout is pictured below. The fan VFD is programmed in the factory before shipment and no field programming is required.



Key and Indicator Legend

Run/Stop LED - ON when the inverter output is ON and the motor is developing torque (Run Mode), and OFF when the inverter output is OFF (Stop Mode).

Program/Monitor LED - This LED is ON when the inverter is ready for parameter editing (Program Mode). It is OFF when the parameter display is monitoring data (Monitor Mode).

Run Key Enable LED - is ON when the inverter is ready to respond to the Run key, OFF when the Run key is disabled.

Run Key - Press this key to run the motor (the Run Enable LED must be ON first). Parameter F_04, Keypad Run Key Routing, determines whether the Run key generates a Run FWD or Run REV command.

Stop/Reset Key - Press this key to stop the motor when it is running (uses the programmed deceleration rate). This key will also reset an alarm that has tripped.

Potentiometer -Allows an operator to directly set the motor speed when the potentiometer is enabled for output frequency control.

Potentiometer Enable LED - ON when the potentiometer is enabled for value entry.

Parameter Display - A 4-digit, 7-segment display for parameters and function codes.

Display Units, Hertz/Amperes - One of these LEDs will be ON to indicate the units associated with the parameter display.

Power LED - This LED is ON when the power input to the inverter is ON.

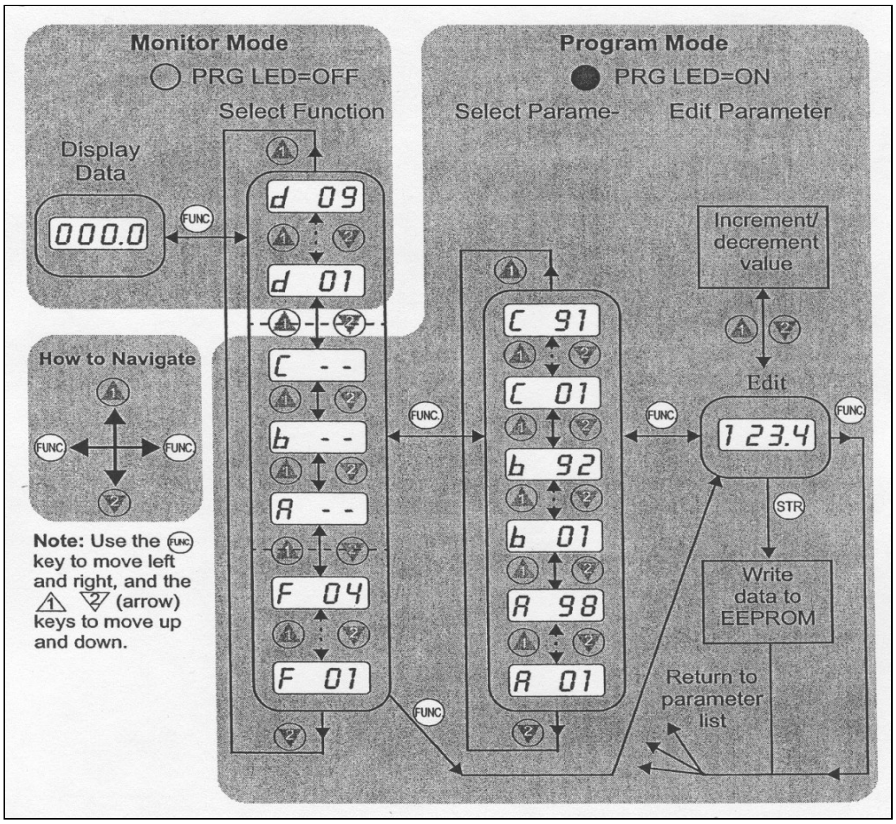
Function Key - This key is used to navigate through the lists of parameters and functions for setting and monitoring parameter values.

Up/Down (1 , 2) Keys - Use these keys alternately to move up or down the lists of parameter and functions shown in the display, and increment/decrement values.

Store (STR) Key - When the unit is in Program Mode and you have edited a parameter value, press the Store key to write the new value to the EEPROM.

Keypad Navigational Map

The CR100 Series inverter front keypad contains all the elements for both monitoring and programming parameters. The diagram below shows the basic navigational map of parameters and functions.



NOTE: The inverter 7-segment display shows lower case "b" and "d," meaning the same as the upper case letters "B" and "D" used in this manual (for uniformity "A to F").

NOTE: The Store Key saves the edited parameter (shown in the display) to the EEPROM in the inverter, regardless of the programming device. Upload and download of parameters is accomplished through a separate command—do not confuse *Store* with *Download* or *Upload.*

Troubleshooting Tips

The table below lists typical symptoms and the corresponding solution(s).

Symptom Condition		Probable Cause	Solution
The motor will not run.	The inverter outputs [U], [V], [W] are not supplying voltage.	• Is the frequency command source A_01 parameter setting correct? • Is the Run command source A-02 parameter setting correct?	• Make sure the parameter setting A-01 is correct. • Make sure the parameter setting A-02 is correct.
		• Is power being supplied to terminals [L1], [L2], and [L3/N]? If so, the POWER lamp should be ON.	• Check terminals [L1], [L2], and [L3/N], then [U/T1], [V/T2], and [W/T3]. • Turn ON the power supply or check fuses.
		• Is there an error code *E X X* displayed?	• Press the Func. key and determine the error type. Eliminate the error cause, then clear the error (Reset).
		• Are the signals to the intelligent input terminals correct? • Is the Run Command active? Is the {FW] terminal (or [RV]) connected to [P24] (via switch, etc.)	• Verify the terminal functions for C_01 – C_05 are correct. • Turn ON Run Command enable. • Supply 24V to {FW] or [RV] terminal, if configured.
		• Has the frequency setting for F_01 been set greater than zero? • Are the control circuit terminals [H], [O], and [L] connected to the potentiometer?	• Set the parameter for F_01 to a safe, non-zero value. • If the potentiometer is the frequency setting source, verify voltage at [O] > 0V.
		• Is the RS (reset) function or FRS (free-run stop) function ON?	• Turn OFF the command(s).
	Inverter outputs [U], [V], [W] are supplying voltage.	• Is the motor load too heavy?	• Reduce load, and test the motor independently.
	The optional remote operator is used (SRW).	• Are the operational settings between the remote operator and the inverter unit correct?	• Check the operator type setting.
The direction of the motor is reversed.		• Are the connections of output terminals [U/T1], [V/T2], and [W/T3] correct? • Is the phase sequence of the motor forward or reverse with respect to [U/T1], [V/T2], and [W/T3]?	• Make connections according to the phase sequence of the motor. In general: FWD = U-V-W, and REV = U-W-V.
		• Are the control terminals [FW] and [RW] wired correctly? • Is parameter F_04 properly set?	• Use terminal [FW] for forward, and [RV] for reverse. • Set motor direction in F_04.
The motor speed will not reach the target frequency (desired speed).		• If using the analog input, is the current or voltage at [O] or [OI]?	• Reduce the load. • Heavy loads activate the overload restriction feature (reduces output as needed).
		• Is the load too heavy?	• Reduce the load • Heavy loads activate the overload restriction feature (reduces output as needed).
		• Is the inverter internally limiting the output frequency?	• Check max frequency setting (A_04). • Check frequency upper limit setting (A_61).
The RPM of the motor does not match the inverter output frequency setting.		• Is the maximum frequency setting A_04 correct? • Does the monitor function D_01 display the expected output frequency?	• Verify the V/f settings match motor specification. • Make sure all scaling (such as A_11 to A_14) is properly set.

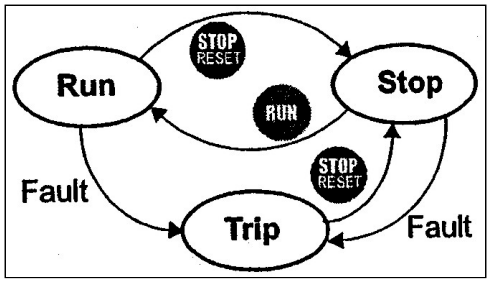
Continued on next page.

Symptom Condition		Probable Cause	Solution
Inverter data is not correct.	No downloads have occurred.	• Was power turned OFF after a parameter edit but before pressing the Store key?	• Edit the data and press the Store key once.
		• Edits to data are permanently stores at power down. Was the time from power OFF to power ON less than six seconds?	• Wait six seconds or more before turning power OFF after editing data.
	A download to the inverter was attempted.	• Was the power turned OFF within six seconds after the display changed from REMT to INV?	• Copy data to the inverter again, and keep power ON for six seconds or more after copying.
A parameter will not change after an edit (reverts to old setting).	True for certain parameters.	• Is the inverter in Run Mode? Some parameters cannot be edited during Run Mode.	• Put inverter in Stop Mode (press the Stop/reset key). Then edit the parameter.
	True for all parameters.	• If you're using the [SFT] intelligent input (software lock function)—is the [SFT] input ON?	• Change the state of the SFT input, and check the B_31 parameter (SFT mode).

Monitoring Trip Events, History. & Conditions

Fault Detection and Clearing

The microprocessor in the inverter detects a variety of fault conditions and captures the event, recording it in a history table. The inverter output turns OFF, or "trips" similar to the way a circuit breaker trips due to an over-current condition. Most faults occur when the motor is running (refer to the diagram to the right). However, the inverter could have an internal fault and trip in Stop Mode. In either case, you can clear the fault by pressing the Stop/Reset key.



Error Codes

An error code will appear on the display automatically when a fault causes the inverter to trip. The following table lists the cause associated with the error:

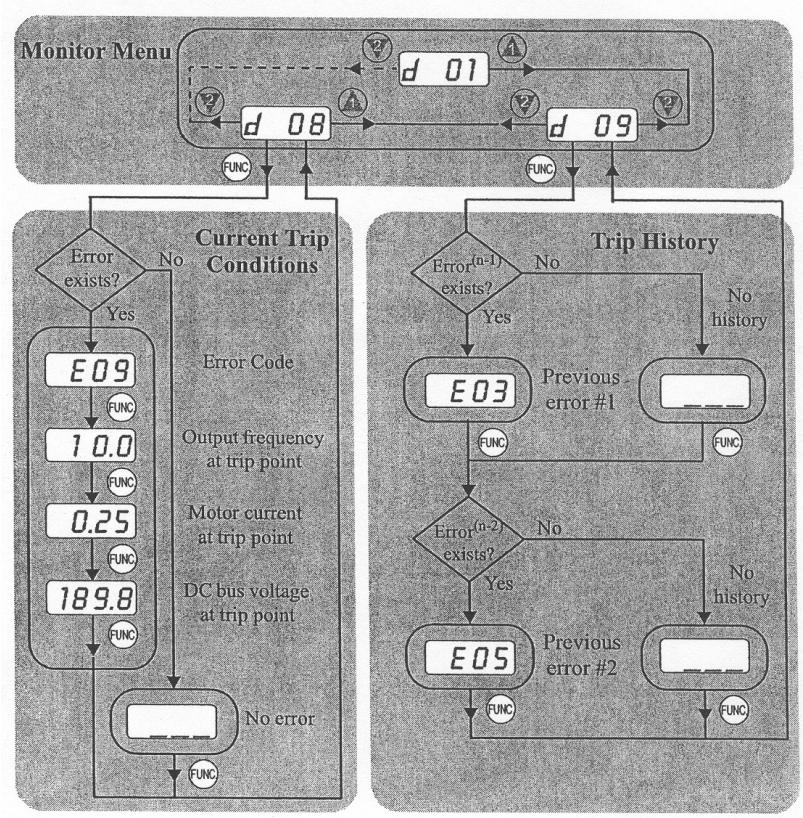
Error Code	Name	Cause(s)
E01	Over current event while at constant speed	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current *for the* inverter, so the inverter output is turned OFF. The dual-voltage motor is wired incorrectly.
E02	Over current event during deceleration	
E03	Over current event during acceleration	
E04	Over current event during other conditions	
E05	Overload protection	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output.
E07	Over voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.
E08	EEPROM error	When the built-in EEPROM memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.
E09	Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.
E11 *E22*	CPU error	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.
E12	External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.
E13	USP	When the Unattended Start Protection (LJSP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.
E14	Ground fault	The inverter is protected by the detection of ground faults between the inverter output and the motor during powerup tests. This feature protects the inverter, and does not protect humans.
E15	Input over-voltage	When the input voltage is higher than the specified value, it is detected 100 seconds after powerup and the inverter trips and turns OFF its output.
E21	Inverter thermal trip	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.
E35	Thermistor	When a thermistor is connected to terminals {5} and [CM1] and the inverter has sensed the temperature is too high, the inverter trips and turns OFF the output.
---U	Under-voltage (brownout) with output shutoff	Due to low input voltage, the inverter turns its output OFF and tries to restart. If it fails to restart, then the alarm trips to record the under-voltage error event.

Note: If an EEPROM error (E08) occurs, be sure to confirm the parameter data values are still correct. If the power is turned OFF while the [RS] (Reset) intelligent input terminal is ON, an EEPROM error will occur when power is restored.

Trip History and Inverter Status

Always find the cause of the fault before clearing it. When a fault occurs, the inverter stores important performance data at the moment of the fault. To access the data, use the monitor functions (D_xx) and select D_08 for details about the present fault (E^n), or the error code for the past two trip events (E^{n-1}) and E^{n-2}) using the D_09 Trip History function.

The following Monitor Menu map shows how to access the error codes. When fault(s) exist, you can review their details by first selecting the proper function: D_08 displays current trip data, and D09 displays trip history.



VFD Monthly and Yearly Inspection Chart

Item Inspected		Check for ...	Frequency		Inspection Method	Criteria
			Month	Year		
Overall	Ambient environment	Extreme Temperatures & humidity	✓		Thermometer, hygrometer	Ambient temperature between – 10 to 40°C, non-condensing
	Major devices	Abnormal noise & vibration	✓		Visual & aural	Stable environment for electronic controls
	Power supply voltage	Voltage tolerance	✓		Digital volt meter, measure between inverter terminals [L1], [L2], [L3}	200V class: 200 to 240V 50/60 Hz 400V class: 380 to 460V 50/60 Hz
Main circuit	Ground Insulation	Adequate resistance		✓	Digital volt meter, GND to terminals	5 Meg. Ohms or greater
	Mounting	No loose screws		✓	Torque wrench	M3: 0.5 – 0.6 Nm M4: 0.98 – 1.3 Nm M5: 1.5 – 2.0 Nm
	Components	Overheating		✓	Thermal trip events	No trip events
	Housing	Dirt, dust		✓	Visual	Vacuum dust & dirt
	Terminal block	Secure connections		✓	Visual	No abnormalities
	Smoothing capacitor	Leading, swelling	✓		Visual	No abnormalities
	Relay(s)	Chattering		✓	Aural	Single click when switching ON or OFF
	Resistors	Cracks or discoloring		✓	Visual	Use Ohm meter to check braking resistors
	Cooling fan	Noise	✓		Power down, manually rotate	Rotation must be smooth
		Dust	✓		Visual	Vacuum to clean
Control circuit	Overall	No order, discoloring, corrosion		✓	Visual	No abnormalities
	Capacitor	No leaks or deformation	✓		Visual	Undistorted appearance
Display	LEDs	Legibility	✓		Visual	All LED segments work

Important Messages

WARNING

WARNING HIGH VOLTAGE: Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housings or protrusions at or above line potential. Extreme care should be taken to protect against shock.
Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs.
Disconnect power before checking controllers or performing maintenance.
Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating machinery.

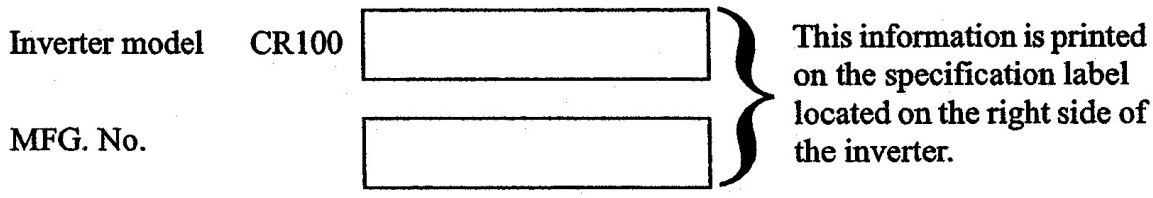
WARNING

Wait at least five (5) minutes after turning OFF the input power supply before performing maintenance or an inspection. Otherwise, there is the danger of electric shock.

Introduction

This end of this section lists the parameters for the CR100 series inverters and the values as programmed in the factory.

Unit identification


Inverter model
CR100
MFG. No.
This information is printed on the specification label located on the right side of the inverter.

Parameter Settings for Keypad Entry

Main Profile Parameters

"F" Group Parameters		McQuay Setting
Function Code	Name	
F_01	Output Frequency Setting	0.0
F_02	Acceleration (1)	10.0
F_03	Deceleration (1)	10.0
F_04	Keypad Run Key Routing	00

Standard Functions

"A" Group Parameters		McQuay Setting
Function Code	Name	
A_01	Frequency source setting	01
A_02	Run command source setting	01
A_03	Base frequency setting	60.0
A_04	Maximum frequency setting	60.0
A_11	O-L input active range start frequency	0
A_12	O-L input active range end frequency	0
A_13	O-L input active range start voltage	0
A_14	O-L input active range end voltage	100
A_15	O-L input start frequency enable	01
A_16	External frequency filter time constant	8
A_20	Multi-speed 0 setting	0
A_21	Multi-speed 1 setting	0
A_22	Multi-speed 2 setting	0
A_23	Multi-speed 3 setting	0
A_24	Multi-speed 4 setting	0
A_25	Multi-speed 5 setting	0
A_26	Multi-speed 6 setting	0
A_27	Multi-speed 7 setting	0
A_28	Multi-speed 8 setting	0
A_29	Multi-speed 9 setting	0
A_30	Multi-speed 10 setting	0
A_31	Multi-speed 11 setting	0
A_32	Multi-speed 12 setting	0
A_33	Multi-speed 13 setting	0
A_34	Multi-speed 14 setting	0
A_35	Multi-speed 15 setting	0
A_38	Jog frequency setting	1.0
A_39	Jog stop mode	00
A_41	Torque boost method selection	00
A_42	Manual torque boost value	11
A_43	Manual torque boost frequency adjustment	10.0
A_44	V/f characteristic curve selection	00
A_45	V/f gain setting	100
A_51	DC braking enable	00
A_52	DC braking frequency setting	0.5

"A" Group Parameters		McQuay Setting
Function Code	Name	
A_53	DC braking wait time	0.0
A_54	DC braking force during deceleration	0
A_55	DC braking time during deceleration	0.0
A_61	Frequency upper limit setting	0.0
A_62	Frequency lower limit setting	0.0
A_63 A_65 A_67	Jump (center) frequency setting	0.0
A_64 A_66 A_68	Jump (hysteresis) frequency width setting	0.5
A_71	PID Enable	00
A_72	PID proportional gain	1.0
A_73	PID integral time constant	1.0
A_74	PID derivative gain	0.0
A_75	PV scale conversion	1.00
A_76	PV source setting	00
A_81	AVR function select	00
A_82	AVR voltage select	230/460
A_92	Second acceleration time setting	15.0
A_93	Second deceleration time setting	15.0
A_94	Select method to switch to second accel/decel profile	00
A_95	Acc1 to Acc2 frequency transition point	0.0
A_96	Dec1 to Dec2 frequency transition point	0.0
A_97	Acceleration curve selection	00
A_98	Deceleration curve selection	00

Fine Tuning Functions

"B" Group Parameters		McQuay Setting
Function Code	**Name**	
B_01	Selection of automatic restart	00
B_02	Allowable under-voltage power failure time	1.0
B_03	Retry wait time before motor restart	1.0
B_12	Level of electronic thermal setting	Rated current for each inverter
B_13	Electronic thermal characteristic	01
B_21	Overload restriction operation mode	01
B_22	Overload restriction setting	Rated current x 1.25
B_23	Deceleration rate at overload restriction	1.0
B_31	Software lock mode selection	01
B_32	Reactive current setting	Rated current x 0.58
B_81	{FM] terminal analog meter adjustment	80
B_82	Start frequency adjustment	0.5
B_83	Carrier frequency setting	5.0
B_84	Initialization mode (parameters or trip history)	00
B_85	Country code for initialization	02
B_86	Frequency scaling conversion factor	1.0
B_87	STOP key enable	00
B_88	Restart mode after FRS	00
B_89	Data select for digital op. OPE-J	01

Intelligent Terminal Functions

"C" Group Parameters		McQuay Setting
Function Code	**Name**	
C_01	Terminal [1] function	00
C_02	Terminal [2] function	01
C_03	Terminal [3] function	16
C_04	Terminal [4] function	13
C_05	Terminal [5] function	18
C_11	Terminal [1] active state	00
C_12	Terminal [2] active state	00
C_13	Terminal [3] active state	00
C_14	Terminal [4] active state	01
C_15	Terminal [5] active state	00
C_21	Terminal [11] function	01
C_22	Terminal [12] function	00
C_23	[FM] signal selection	00
C_31	Terminal [11] active state (-FU)	00
	Reserved (-FE / FR)	
C_32	Terminal [12] active state (-FU)	00
	Terminal [11] active state (-FE / FR)	
C_33	Alarm relay terminal active state	01
C_41	Overload level setting	Inverter rated current
C_42	Frequency arrival setting for accel	0.0
C_43	Arrival frequency setting for decel	0.0
C_44	PID deviation level setting	3.0
C_91	Debug mode enable	00

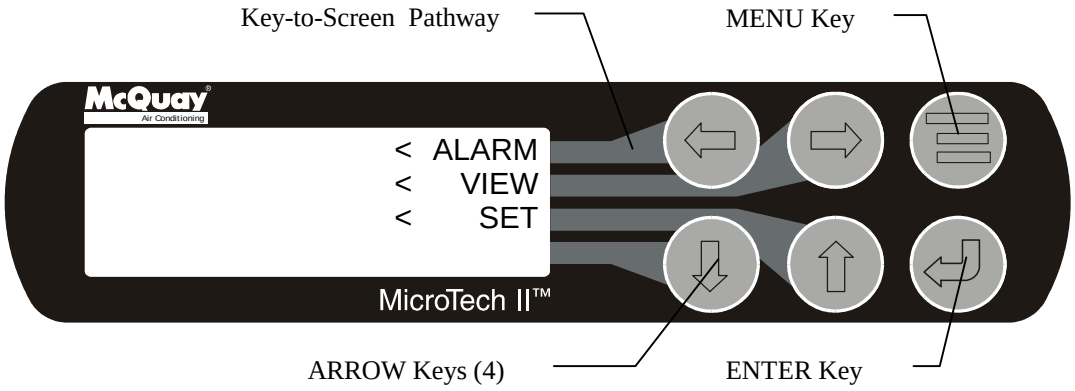
Using the Controller

4x20 Display & Keypad

Layout

The 4-line by 20-character/line liquid crystal display and 6-key keypad are shown below.

Figure 33, Display (in MENU mode) and Keypad Layout



Note that each ARROW key has a pathway to a line in the display. Pressing an ARROW key will activate the associated line when in the MENU mode.

Getting Started

There are two basic procedures to learn in order to utilize the MicroTech II controller:

1. Knowing where a particular screen is located and how to navigate to reach it.
2. Knowing what is contained in a menu screen and how to read that information, or how to change a setpoint contained in the menu screen.

Powering Up

When the controller is powering up, the following screen appears:

```
Selftest
Please wait
```

When the self-test is complete, the following screen will appear automatically:

```
McQuay
MicroTech II
ACZ-Dual Circuit
Ver: ACZD20101A
```

Ver: is the software version install in the controller.

Version Number

The software version number is displayed during power up (see above) and can be accessed at any time by pressing the MENU Key and the ENTER Key simultaneously.

Navigating Through the Menus

The menus are arranged in a matrix of screens across a top horizontal row. Some of these top-level screens have sub-screens located under them. The general content of each screen and its location in the matrix are shown in Figure 35 on page 114. A detailed description of each menu begins on page 115.

There are two ways to navigate through the menu matrix to reach a desired menu screen.

1. Scroll Mode: Scroll through the matrix from one screen to another using the four ARROW keys.
2. Menu Mode: Use shortcuts to work through the matrix hierarchy. From any screen, pressing the MENU key will take you to the top level of the menu hierarchy. The display will show ALARM, VIEW, and SET as shown in Figure 33. This corresponds to the second row of screens on Figure 32. One of these groups of screens can then be selected by pressing the key connected to it via the pathway shown in Figure 33.

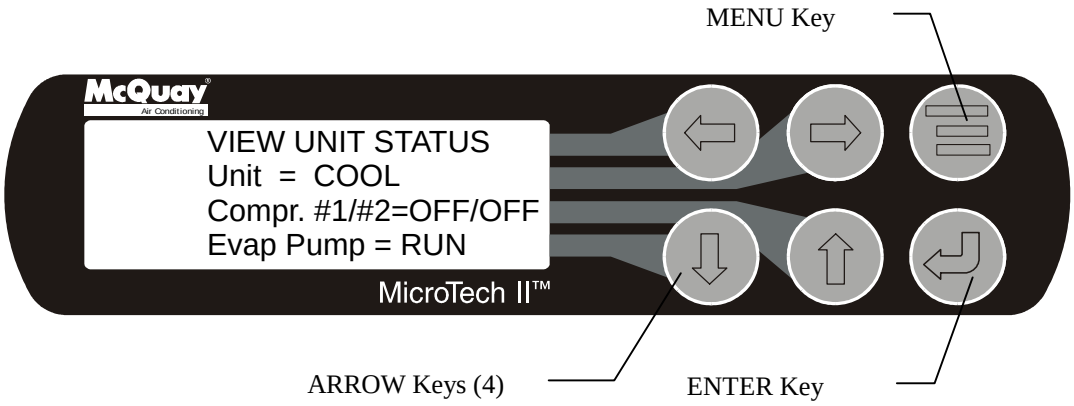
For example, selecting ALARM will go the next row of menus under ALARM (ALARM LOG or ACTIVE ALARM). Selecting VIEW will go the next level of screens under VIEW (VIEW UNIT STATUS or VIEW UNIT TEMP). Selecting SET will go to a series of screens for looking at and changing setpoints.

MENU Key

The MENU key is used to switch between the shortcut method (known as the MENU mode and as shown in Figure 30) and scrolling method (known as the SCROLL mode shown in Figure 31). The MENU mode is the shortcut to specific groups of menus used for checking ALARMS, for VIEWING information, or to SET setpoint values. The SCROLL mode allows the user to move about the matrix (from one menu to another, one at a time) by using the four ARROW keys. A typical menu screen is shown in Figure 31.

Pressing the MENU key from any screen will automatically return you to the MENU mode as shown in Figure 33.

Figure 34, Display in the Shortcut (SCROLL) Mode and Keypad Layout

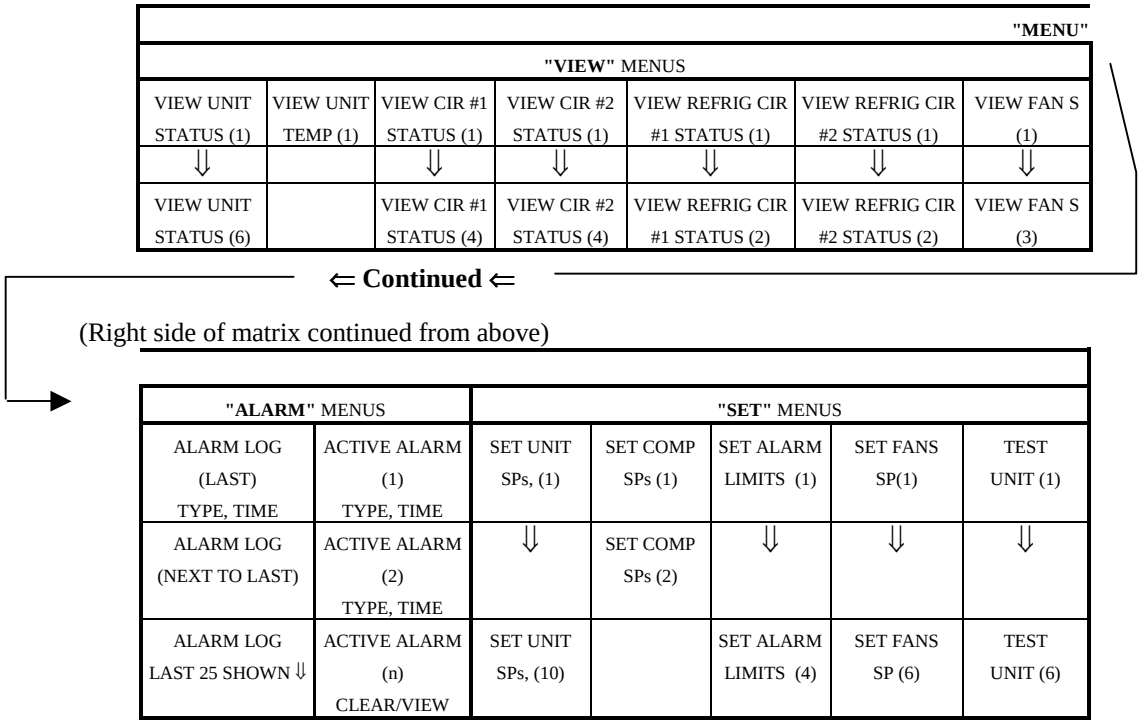


Menu Screens

The menus are shown in the controller display. Each menu screen shows specific information; in some cases menus are used only to *view* the status of the unit, in some cases they are used for checking and clearing *alarms*, and in some cases they are used to *set* setpoint values.

The ARROW keys on the controller can be used to navigate through the menus. The keys are also used to change numerical setpoint values contained in certain menus.

Figure 35, Menu Matrix


"MENU"
"VIEW" MENUS
VIEW UNIT STATUS (1)
VIEW UNIT TEMP (1)
VIEW CIR #1 STATUS (1)
VIEW CIR #2 STATUS (1)
VIEW REFRIG CIR #1 STATUS (1)
VIEW REFRIG CIR #2 STATUS (1)
VIEW FAN S (1)
VIEW UNIT STATUS (6)
VIEW CIR #1 STATUS (4)
VIEW CIR #2 STATUS (4)
VIEW REFRIG CIR #1 STATUS (2)
VIEW REFRIG CIR #2 STATUS (2)
VIEW FAN S (3)
⇐ Continued ⇐
(Right side of matrix continued from above)
"ALARM" MENUS
"SET" MENUS
ALARM LOG (LAST) TYPE, TIME
ACTIVE ALARM (1) TYPE, TIME
SET UNIT SPs, (1)
SET COMP SPs (1)
SET ALARM LIMITS (1)
SET FANS SP(1)
TEST UNIT (1)
ALARM LOG (NEXT TO LAST)
ACTIVE ALARM (2) TYPE, TIME
SET COMP SPs (2)
ALARM LOG LAST 25 SHOWN ⇓
ACTIVE ALARM (n) CLEAR/VIEW
SET UNIT SPs, (10)
SET ALARM LIMITS (4)
SET FANS SP (6)
TEST UNIT (6)

Menu Structure (Hierarchical)

As discussed previously, a hierarchical menu structure can be used to access the various screens. One to twenty-five levels can be used below the top-level menu, with two or three being typical. Optionally, the last menu selection can access one of a set of screens that can be navigated with the UP/DOWN ARROW keys (see the scrolled menu structure below).

Menu selection is initiated by pressing the MENU key that changes the display from a regular data screen to a menu screen. Menu selections are then made using the arrow keys according to labels on the right side of the display (the arrows are ignored). When the last menu item is selected, the display changes to the selected data screen. An example follows showing the selection of the "VIEW COMPRESSOR screen.

Suppose the initial screen is as below or any other menu screen:

```
ALARM LOG
     (data)
     (data)
     (data)
```

After pressing the MENU key, the top level menu screen will show:

```
          < ALARM
          < VIEW
          <  SET
```

RIGHT ARROW KEY ⇒

After pressing the “VIEW” menu key, a menu screen will show:

```
VIEW    <        UNIT
        < COMPRESSOR
        < REFRIGRANT
        <        FANS
```

Selection of any of these will advance to the appropriate data menu. For example, after pressing the “**REFRIGERANT**” menu button, the selected data screen will show:

```
VIEW REFRIG
          PSI    °F
SAT EVAP XXX.X  XX.X
SAT COND XXX.X  XX.X
```

The ARROW keys will automatically return to the “scroll” mode at this time.

Screen Definitions

This section contains information on each menu screen. The menu screens are in order of the matrix in Figure 35, going from left to right and then down when there are sub-menus. Many menus are self-explanatory.

VIEW MENUS

View Unit Status

```
VIEW UNIT STATUS (1)
Off:Unit Switch
Stage=X   Request=X
Evap Fan=Off
```

Unit states can be OFF, AUTO, and ALARM as determined by the authority Switch, Remote, Etc. Stage is the number of compressor stages on.

Request is the number of cooling stages called for via digital inputs from the remote thermostat.

Evap Fan can be ON or OFF and is the state of the evaporator fan (or pump) as called for by the controller (not necessarily whether the fan/pump is actually on). If the unit is enabled and at least one circuit is able to run, the controller sends a signal to start the evaporator fan/pump (terminals #33 and #35 on TB1). If air or water flow is sensed from a flow switch (terminals #44 and #61 on TB1) for at least 10 seconds, the unit will start at a call for cooling. On DX air handlers, this output and input do not have to be used, in which case a jumper is required across terminals #44 and #61.

```
VIEW UNIT STATUS (2)
Demand Limit= Stg X
Network Limit=Stg X
```

```
VIEW UNIT STATUS (3)
Stg Up Delay=XXXXsec
Stg Dn Delay=XXXXsec
```

```
VIEW UNIT STATUS (4)
D.O.      111111111
 123456789012345678
 111111111111111111
```

This menu gives the status of digital outputs (D.O.), 1=ON, 0=OFF. Numbers are 1 through 18. See Digital Outputs on page 93 for number reference.

```
VIEW UNIT STATUS (5)
D.I.      111111111
 123456789012345678
 111111111111111111
```

This menu gives the status of digital inputs (D.I.). 1=ON, 0=OFF. Numbers are 1 through 18. See Digital Inputs on page 93 for number reference.

```
VIEW UNIT STATUS (6)
   Analog Outputs
   (volts X 100)
1=XXX.X   2=XXX.X
```

This menu give the output voltage for fans #1 and #2 optional VFD. Divide by 100 for actual voltage.

```
VIEW UNIT TEMP
OAT = XXX.X °F
```

OAT = Outside Air Temperature

View Circuit Status

```
VIEW CIR1 STATUS (1)
Off:Pumpdown Switch
```

```
VIEW CIR1 STATUS (2)
Comp1=Off
Hours= XXXXX
Starts= XXXXX
```

```
VIEW CIR1 STATUS (3)
Comp2=Off
Hours= XXXXX
Starts= XXXXX
```

```
VIEW CIR1 STATUS (4)
Comp3=Off
Hours= XXXXX
Starts= XXXXX
```

Screens 1 through 4 above are repeated for circuit #2. Screen #4 is only used on three compressor units (ACZ 120 through ACZ 155).

View Refrigerant Status

```
VIEW REFRG CIR 1 (1)
Evap Press= XXX.Xpsi
Cond Press= XXX.Xpsi
```

The evaporator pressure is measured at the compressor's common suction line and should be considered as suction pressure rather than evaporator pressure.

```
VIEW REFRG CIR 1 (2)
Sat Evap= XXX.X °F
Sat Cond= XXX.X °F
VFD Target= XXX.X °F
```

Screens #1 and #2 above are repeated for circuit #2.
VFD information appears above and on other screens only when the VFD option is furnished and VFD Enable is entered as YES on a setpoint screen.

View Fan Status

```
VIEW FANS          (1)
  Fans On  VFD Speed
Cir 1= X     XXX.X%
Cir 2= X     XXX.X%
```

X is the number of fans running on each circuit. XXX.X% is the VFD percent of full load speed.

```
VIEW FANS          (2)
Stg Error  Up   Down
Cir 1=     XXX  XXX
Cir 2=     XXX  XXX
```

```
VIEW FANS          (3)
Sat Cond
 Target= XXX.X°F
```

ALARM SCREENS

Alarm log

```
Alarm Log          (X)
Alarm Description
Time/Date
Data:Edit and scroll
```

The last 25 alarms are shown in this menu, with earlier alarm menus stored under it. ARROW DOWN from this menu to go the next-to-last alarm, ARROW DOWN again will go to the second from last, and so on, through the last 25 occurrences. The screens are numbered (1), (2), (3).....(25).

Active Alarm

```
Alarm Active
Alarm Description
Time/Date
```

.

```
Alarm Active
No more alarms
Press ENTER to clear
   all active alarms
```

If the unit is off on a shutdown alarm, or running but in a limit alarm condition, the cause, date/time, and UNIT STATUS will appear in the ALARM ACTIVE screen. The remote alarm relay will close, and a red light will appear behind the LEFT button. The light will go out when the fault is cleared. If there is a simultaneous occurrence of more than one alarm, the others will appear in additional screens below this one, accessed by the DOWN ARROW.

If an alarm occurs, press the MENU button, then the LEFT button for ALARM, and then the left button again to reach the ALARM ACTIVE screen.

The cause of the alarm must be remedied before attempting to clear the alarm. To clear the alarm(s), scroll down to the last screen (bottom screen above) and press ENTER. The SET UNIT SPs screen will appear and the password will be asked for. Press ENTER and the cursor will flash in the password field. Press the UP button to scroll the numbers up to the required password. Then press ENTER to enter the password. Then return to the ALARM ACTIVE screen and press ENTER to clear the alarm.

If other faults have appeared, they will all be cleared at the same time.

SET MENUS

Changing setpoints; setpoints are changed as follows:

1. A password must be entered before attempting to change any setpoint. Two four-digit passwords provide OPERATOR and MANAGER levels of access to setpoints. The passwords are preprogrammed into the controller. The Operator Password is 0100, the Manager Password is 2001. Either password must be entered using the ENTER PASSWORD screen (15) before a protected setting can be changed. The quickest way to reach screen (15) is to press the MENU key, then press SET (UP Arrow Key), then press the UP Arrow key, which will go to screen (15). Press ENTER to reach the numerical field, hold the UP Arrow key to scroll the numbers up to the desired password, then press ENTER. The word “Operator” or “Manager” will appear next to Level when the password is entered properly. Setpoints can now be changed. Once entered, a password remains valid for 15 minutes after the last key-press.
2. Select the desired menu by scrolling through SET menus with the UP, DOWN, LEFT and RIGHT ARROWS. Alternatively, press the MENU button, select the type of setpoint desired, then scroll up or down to the desired menu screen.
3. When the desired menu screen is reached, select the desired field within the menu by moving between lines using the ENTER key. Some fields may not be accessible due to settings in other menus.
4. If a numerical value is being changed, use the INCREMENT key (UP ARROW) to increase or the DECREMENT key (DOWN ARROW) to decrease the value of the setpoint.
5. If a word type setpoint (for example, YES or NO) is to be selected, the choices are pre-loaded into the menu and selected by scrolling through the available setpoint options using the UP ARROW key.

6. Enter the desired value or word into the controller by pressing the ENTER key. Note that pressing the <C (RIGHT Arrow Key) will cancel the entry and pressing <D will go to the factory default setting.

Stated another way, once the desired set screen is reached, editing is accomplished by pressing the ENTER key until the desired field is selected within the set screen. This field is indicated by the cursor blinking on it. The arrow keys will then operate as defined below.

<D DEFAULT..... Set value to original factory setting
<C CANCEL ..... This function is not currently operative
<+ INCREMENT..... Increase the value or select the next item in a list.
<– DECREMENT.... Decrease the value or select the previous item in a list.

During edit mode, the display shows a two-character-wide menu pane on the right as shown below. These characters relate to the functions shown above. After a field has been set to the desired new values, press ENTER. This enters the value and scrolls to the next field.

```
SET UNIT SPs (X)   <D
     (data)        <C
     (data)        <+
     (data)        <-
```

Additional fields can be edited by pressing the ENTER key until the desired field is selected.

Set Unit Setpoints

```
SET UNIT SPs      (1)
Unit Enable = OFF
Mode = COOL
Source = KEYPAD
```

Unit Enable is an external signal, or a keypad setting, that keeps the unit off when the setting is OFF, and *allows* it to run if there is a call for cooling when the setting is ON. The source for the signal is selected in the 4th line and can be:

1. KEYPAD, in which case the selection is made in line 2 and would be normally selected as ON. This is the normal setting when no external signals are controlling the unit.
2. DIGITAL INPUT, in which an external switch is wired across terminals #25 and #35. (See wiring diagram page 48).
3. NETWORK, used with BAS signal.

Unit Mode settings can be:

1. COOL, normal setting used with air conditioning applications.
2. TEST, for use by service technician for certain test procedures.

```
SET UNIT SPs      (2)
Available Modes
  =COOL
Set w/UnitSwitch Off
```

Available modes are COOL and TEST. The unit must be shut off when changing Mode.

```
SET UNIT SPs      (3)
Demand Limit=No
Multipoint Power=No
LowAmbLock= XX.X°F
```

```
SET UNIT SPs     (4)
       CLOCK
     dd/mm/yyyy
     hh:mm weekday
```

```
SET UNIT SPs     (5)
Units = °F/psi
Lang  = ENGLISH
```

Units settings are only °F/psi at the present time. °C/kPa will be available later.
Lang (Language) settings can be only ENGLISH at present.

```
SET UNIT SPs     (6)
Protocol = Modbus
Ident Number=001
Baud Rate=9600
```

Ident Number and Baud Rate are in effect when BAS is selected in the SET screen (Modbus only).

```
SET UNIT SPs     (7)
Evap Pressure Sensor
Cir1 Offset= XX.Xpsi
Cir2 Offset= XX.Xpsi
```

```
SET UNIT SPs     (8)
Cond Pressure Sensor
Cir1 Offset= XX.Xpsi
Cir2 Offset= XX.Xpsi
```

```
SET UNIT SPs     (9)
Outside Ambient
Temperature Sensor
Offset= XX.X °F
```

The pressure offsets on menus 7 and 8 and the temperature offsets on menus 9 correct the controller's display of the parameters. The sensors used in these units have a high degree of repeatability but may need initial correction (offset). An accurate pressure gauge or thermometer is used to determine the correct temperature or pressure. A positive or negative offset value is then entered to make the controller reading agree with the measured value.

```
SET UNIT SPs    (10)
ENTER PASSWORD: XXXX
 Active Password
 Level: None
```

Set Compressor Setpoints

```
SET COMP SPs (1)
# of Compressors=X
Stop-Start  =XXmin
Start-Start =XXmin
```

This menu sets the anti-recycle timers. Stop-Start is the time required before starting a compressor after it has *stopped*. Start-Start is the time required before starting a compressor after the last time it has *started*. It is recommended that these default values not be changed.

```
SET COMP SPs (2)
InterStgUp= XXXsec
InterStgDn= XXXsec
Clear Cycle Tmrs=no
```

InterStageUp is the time delay since the last stage change before a compressor can stage on.
InterStageDn is the time delay since the last stage change before a compressor can stage off normally (not by an alarm).

Set Alarm Screens

```
SET ALARM LIMITS (1)
LowEvPrHold=XXXpsi
LowEvPrUnld=XXXpsi
```

The LowEvPrHold and LowEvPrUnld have the same default value of 59 psi. If two compressors are running, the LowEvPrUnld is in effect and the lag compressor will be shut off to unload the unit. If one compressor is running, the LowEvPrHold is in effect and the lag compressor is prevented from starting, thereby holding the unit capacity.

```
SET ALARM LIMITS (2)
HiCondPr = XXX.Xpsi
HiPrStgDn= XXX.Xpsi
EvapFlowProof=XXXsec
```

HighCondPr (the unit high-discharge-pressure shutdown) is a stop alarm that shuts off the unit when the discharge pressure reaches the setting. The default setting is 385 psi. The HiCondStDn is a limit alarm that unloads the unit in an attempt to prevent total shutdown from the HighCondPr. The stage down is set at 370 psi.

EvapFlowProof setting is only required when a proof of flow signal is wired to the controller. See EvapFan discussion on page 115.

```
SET ALARM LIMITS (3)
PhaseVoltage = N
Ground Fault = N
```

SET Fan Setpoints

```
SET FANS SPs     (1)
Number of fans=X
Fan VFD=no
```

```
SET FANS SPs     (2)
Stg Up Deadband(°F)
  Stg2  Stg3  Stg4
  XX.X  XX.X  XX.X
```

```
SET FANS SPs     (3)
Stg Dn Deadband(°F)
Stg0 Stg1 Stg2 Stg3
XX.X XX.X XX.X XX.X
```

```
SET FANS SPs     (4)
VFD Min Speed=  XX%
VFD Max Speed= XXX%
```

```
SET FANS SPs     (5)
Cond Sat Temp Target
Setpoint= XXX.X °F
```

```
SET FANS SPs     (6)
# Fans On At Startup
 >75°F >90°F >105°F
    1     2     3
```

Screen Definitions – TEST

The field test screens are only available when the unit is in TEST mode. Using these screens, any digital output can be controlled manually.

```
TEST UNIT        (1)
Alarm Signal=Off
```

```
TEST UNIT        (2)
Liq Line Sol 1=Off
Compressor  HG1=Off
1=Off 3=Off 5=Off
```

```
TEST UNIT        (3)
Liq Line Sol 2=Off
Compressor  HG2=Off
2=Off 4=Off 6=Off
```

```
TEST UNIT        (4)
Fan 1= Off
Fan 3= Off
Fan 5/7= Off
```

```
TEST UNIT        (5)
Fan 2= Off
Fan 4= Off
Fan 6/8= Off
```

```
TEST UNIT        (6)
Fan VFD 1= 000.0%
Fan VFD 2= 000.0%
```

Start-up

Pre Start-up

The unit must be inspected to see that no components became loose or damaged during shipping or installation.

Start-Up

There should be adequate building load (at least 50 percent of the unit full load capacity) to properly check the operation of the unit's refrigerant circuits.

Record all operating parameters required by the "Compressorized Equipment Warranty Form". Return this information within 10 working days to McQuay International as instructed on the form to register the start-up date with the McQuay Warranty Department.

1. Verify chilled water or air-flow.
2. Verify that the remote start / stop or time clock has requested the chiller to start.
3. Set the thermostat setpoint to required temperature. For AGZ-AM units, the system water temperature must be greater than the total of the leaving water temperature setpoint plus 1/2 the control band before the MicroTech II controller will stage on cooling. Set the Evap Delta T and the Start Delta T as a starting point.
4. Put both pumpdown switches (PS1 and PS2) to the ON position.
5. Put system switch (S1) to ON position.

Switch	Switch Position	
	ON	OFF
PS1, PS2, Pumpdown Switches	Circuits will operate in the normal automatic mode	Circuit will go through the normal pumpdown cycle and shut off.
S1, System Switch	Unit will operate in the normal automatic mode	Unit will shut off immediately without pumping down (emergency stop)

6. There can be a delay of 2 minutes after closing S1. The time delay is due to the compressor inherent motor protection or the Stage Up Timer counting. This should only occur on initial start-up or when power to the chiller has been turned off and back on. More than one compressor will not start at the same time.
7. After the chiller has been operating for a period of time and has become stable, check the following:
   - Compressor oil level. (Some scroll compressors do not have oil sight glasses)
   - Refrigerant sight glass for flashing.
   - Rotation of condenser fans.
8. Complete the "Compressorized Equipment Warranty Form".

Shutdown

Temporary

1. Put both circuit switches to the OFF position (Pumpdown and Stop).
2. After compressors have stopped, put System Switch (S1) to OFF (emergency stop).
3. Turn off chilled water pump or air handler if applicable. Chilled water pump to operate while compressors are pumping down.

To start the chiller after a temporary shutdown, follow the start-up instructions.

Extended

1. Front seat both condenser liquid line service valves.
2. Put both circuit switches to the OFF position (Pumpdown and Stop position.)
3. After the compressors have stopped, put System Switch (S1) to the OFF position (emergency stop).
4. Front seat both refrigerant circuit discharge valves (if applicable).
5. If electrical power is on to unit, the compressor crankcase heaters will keep the liquid refrigerant out of the compressor oil. This will minimize start-up time when putting the unit back into service. The evaporator heater will be able to function.
6. If electrical power is off, tag all opened electrical disconnect switches to warn against start-up before the refrigerant valves are in the correct operating position. When starting the unit, electrical power must be on for 24 hours before starting the chiller.

To start the chiller after an extended shutdown, follow the prestart-up and start-up instructions.

Water Piping Checkout

1. Check the pump operation and vent all air from the system.
2. Circulate evaporator water checking for proper system pressure and pressure drop across the chiller barrel. Compare the pressure drop to the evaporator water pressure drop curve.
3. Clean all water strainers before placing the unit into service.

Refrigerant Piping Checkout

1. Check all exposed brazed joints on the unit, as well as any field-installed piping, for evidence of leaks. Joints can have been damaged during shipping or when the unit was installed.
2. Check that all refrigerant valves are either opened or closed as required for proper operation of the unit.
3. A thorough leak test must be done using an approved electronic leak detector. Check all valve stem packing for leaks. Replace all refrigerant valve caps and tighten.
4. Check all refrigerant lines to see that they will not vibrate against each other or against other unit components and are properly supported.
5. Check all flare connections and all refrigerant threaded connectors.
6. Look for any signs of refrigerant leaks around the condenser coils and for damage during shipping or installation.
7. Leak detector is applied externally to refrigerant joints at the factory. Do not confuse this residue with an oil leak.
8. Connect refrigerant service gauges to each refrigerant circuit before starting unit.

Electrical Check Out

⚠ CAUTION

Electrical power must be applied to the compressor crankcase heaters 24 hours before starting unit to drive off refrigerant from the oil or compressor damage can occur.

1. Open all electrical disconnects and check all power wiring connections. Start at the power block and check all connections through all components to and including the compressor terminals. These should be checked again after 3 months of operation and at least annually thereafter.
2. Check all control wiring by pulling on the wire at the spade connections and tighten all screw connections. Check plug-in relays for proper seating and that retaining clips are installed.
3. Put System Switch (S1) to the Emergency Stop position.
4. Put both circuit #1 & #2 switches to the Pumpdown and Stop position.
5. Apply power to the unit. The panel Alarm Light will stay on until S1 is closed. Ignore the Alarm Light for the checkout period. If you have the optional Alarm Bell, you can disconnect it.
6. Check at the power block or disconnect for the proper voltage and for the proper voltage between phases. Check power for proper phasing using a phase sequence meter before starting unit.
7. Check for 120Vac at the control transformer and at TB-2 terminal #1 and the neutral block (NB).
8. Check between TB-2 terminal #7 and NB for 120Vac supply for transformer #2.
9. Check between TB-2 terminal #2 and NB for 120Vac control voltage. This supplies the compressor crank case heaters.
10. Check between TB-3 terminal #17 and #27 for 24Vac control voltage.

Operation

Hot Gas Bypass (Optional)

This option allows the system to operate at lower loads without excessive on/off compressor cycling. The hot gas bypass option is required to be on both refrigerant circuits because of the lead / lag feature of the controller.

This option allows passage of discharge gas into the evaporator inlet (between the TX valve and the evaporator) which generates a false load to supplement the actual chilled water or air handler load.

Note: The hot gas bypass valve cannot generate a 100% false load.

The valve that is supplied can provide a load of approximately 10 tons. The system load added to the ten tons of the hot gas bypass valve has to exceed the compressor capacity for stage 1 compressors to produce stable system operation. This requires 3-6 tons of system load.

A solenoid valve in the hot gas bypass lines is wired in parallel with both circuit's liquid line solenoid valves SV1 and SV2. The hot gas bypass is available whenever a refrigerant circuit is operating. The hot gas valve is regulated by the evaporator pressure and the remote adjustable bulb. The pressure regulating valve is factory set to begin opening at 58 psig (32°F for R-22).

⚠ WARNING

The hot gas line can become hot enough to cause injury. Be careful during valve checkout.

VFD Low Ambient Control (Optional)

The optional VFD fan control is used for unit operation below 35°F (2°C) down to a minimum of 0°F (-17°C). The control looks at the saturated discharge temperature and varies the fan speed to hold the temperature (pressure) at the "target" temperature. This temperature is established as an input to a setpoint screen labeled "Sat Condenser Temp Target".

Filter-Driers (AGZ-BM)

A full flow filter-drier (AGZ 026 – 070) or a replaceable core type filter-drier (AGZ 075 – 130) for each refrigerant circuit is shipped loose for field mounting. The core assembly of the replaceable core drier consists of a filter core held tightly in the shell to allow full flow without bypass.

Pressure drop across the filter-drier at full load conditions must not exceed 10 psig at full load. See Table 60 for pressure drop at other load points. Replace the filter-drier if the pressure drop exceeds maximum.

WARNING

Pump out refrigerant before removing end flange for replacement of core(s). Lowering refrigerant pressure will help prevent accidental blow-off of cover causing possible bodily injury. EPA recovery regulations apply to this procedure.

A condenser liquid line service valve is provided for isolating the charge in the condenser, but also serves as the point from which the liquid line can be pumped out. With the line free of refrigerant, the filter-drier core(s) can be easily replaced.

System Adjustment

To maintain peak performance at full load operation, the system superheat and liquid subcooling can require adjustment. Read the following subsections closely to determine if adjustment is required.

Liquid Line Sight Glass and Moisture Indicator

The color of the moisture indicator is an indication of the dryness of the system and is extremely important when the system has been serviced. Immediately after the system has been opened for service, the element can indicate a wet condition. It is recommended that the equipment operate for about 12 hours to allow the system to reach equilibrium before deciding if the system requires a change of drier cores.

Bubbles in the sight glass at constant full load indicates a shortage of refrigerant, a plugged filter-drier, or a restriction in the liquid line. However, it is not unusual to see bubbles in the sight glass during changing load conditions.

Refrigerant Charging

Liquid line subcooling at the liquid shut-off valve should be between 15 and 20 degrees F at full load. If the unit is at steady full load operation and bubbles are visible in the sight glass, then check liquid subcooling.

Thermostatic Expansion Valve

The expansion valve performs one specific function. It keeps the evaporator supplied with the proper amount of refrigerant to satisfy the load conditions.

The sensing bulb of the expansion valve is installed in the closest straight run of suction line from the evaporator. The bulb is held on by clamps around the suction line and is insulated to reduce the effect of surrounding ambient temperatures. In case the bulb must be removed, simply slit the insulation on each side of the bulb, remove the clamps and then remove the capillary tubing that runs along the suction line from the valve.

The power element is removable from the valve body without removing the valve from the line.

NOTE: Before adjusting superheat, check that unit charge is correct and liquid line sight glass is full with no bubbles and that the circuit is operating under stable, full load conditions.

The suction superheat for the suction leaving the evaporator is set at the factory for 8 to 12 degrees F at full load. To have full rated unit performance, the superheat must be about 8 degrees F at 95°F outdoor ambient temperature.

Crankcase Heaters

The scroll compressors are equipped with externally mounted band heaters located at the oil sump level. The function of the heater is to keep the temperature in the crankcase high enough to prevent refrigerant from migrating to the crankcase and condensing in the oil during off-cycle.

NOTE: Power must be supplied to the heaters 24 hours before starting the compressors.

Evaporator

Models AGZ 026 through 070

The evaporator is a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates.

The evaporator is protected with an electric resistance heater and insulated with 3/4" (19mm) thick closed-cell polyurethane insulation. This provides freeze protection down to -20°F (-29°C) ambient air temperature.

The water side working pressure is 363 psig (2503 kPa). Evaporators are designed and constructed according to, and listed by, Underwriters Laboratories (UL).

Models AGZ 075 through 130

The evaporator is direct expansion, shell-and-tube type with water flowing in the baffled shell side and refrigerant flowing through the tubes. Two independent refrigerant circuits within the evaporator serve the unit's dual refrigerant circuits.

The evaporator has a carbon steel shell and seamless high efficiency copper tubes, roller expanded into a carbon steel tube sheet.

3/8" (10mm) vent and drain plugs are provided on the top and bottom of the shell.

The evaporator is wrapped with an electric resistance heater cable and insulated with 3/4" (19mm) thick vinyl nitrate polymer sheet insulation, protecting against water freeze-up at ambient air temperatures to -20°F (-29°C). An ambient air thermostat controls the heater cable. The fitted and glued-in-place insulation has a K factor of 0.28 Btu in/hr ft^2 at 75°F.

The refrigerant (tube) side maximum working pressure is 300 psig (2068 kPa). The water-side working pressure is 152 psig (1048 kPa). Each evaporator is designed, constructed, inspected, and stamped according to the requirements of the ASME Boiler and Pressure Vessel Code. Double thickness insulation is available as an option.

Unit Maintenance

General

On initial start-up and periodically during operation, it will be necessary to perform certain routine service checks. Among these are checking the liquid line sight glasses, taking condensing and suction pressure readings, and checking to see that the unit has normal superheat and subcooling readings. A recommended maintenance schedule is located at the end of this section.

Compressor Maintenance

The scroll compressors are fully hermetic and require no maintenance.

Lubrication

No routine lubrication is required on AGZ units. The fan motor bearings are permanently lubricated and no further lubrication is required. Excessive fan motor bearing noise is an indication of a potential bearing failure.

Compressor oil should be standard refrigeration mineral oil such as Suniso 3GS.

Electrical Terminals

⚠ DANGER
Electric shock hazard. Disconnect all power before continuing with following service.

Condensers

The condensers are air-cooled and constructed of 3/8" (9.5mm) O.D. internally finned copper tubes, bonded in a staggered pattern into louvered aluminum fins. Maintenance consists of routine removal of dirt and debris from the outside surface of the fins. McQuay recommends the use of foaming coil cleaners available at most air conditioning supply outlets. Use caution when applying such cleaners as they can contain potentially harmful chemicals. Care should be taken not to damage the fins during cleaning. The coils should be thoroughly rinsed to remove any cleaner residue.

If the service technician determines that the refrigerant circuit contains noncondensables, recovery can be required, strictly following Clean Air Act regulations governing refrigerant discharge to the atmosphere. The Schrader purge valves are located on the vertical coil headers on both sides of the unit, at the end opposite from the control box. Decorative panels cover the coil headers and must be removed for servicing. Recover with the unit off, after a shutdown of 15 minutes or longer, to allow air to collect at the top of the coil. Restart and run the unit for a brief period. If necessary, shut unit off and repeat the procedure. Follow accepted environmentally sound practices when removing refrigerant from the unit.

Refrigerant Sight Glass

The refrigerant sight glasses should be observed periodically. (A weekly observation should be adequate.) A clear glass of liquid indicates that there is normal subcooled refrigerant in the system. Bubbling refrigerant in the sight glass, during stable run conditions, indicates that the system can be short of refrigerant charge. Refrigerant gas flashing in the sight glass could also indicate an excessive pressure drop in the liquid line, possibly due to a clogged filter-drier or a restriction elsewhere in the liquid line. See Table 60 for maximum allowable pressure drops. If subcooling is low, add charge to clear the sight glass. If subcooling is normal (15 to 20 degrees F) and flashing is visible in the sight glass, check the pressure drop across the filter-drier. Subcooling should be

checked at full load with at least 70°F (21.1°C) outdoor air temperature, stable conditions, and all fans running.

An element inside the sight glass indicates the moisture condition corresponding to a given element color. If the sight glass does not indicate a dry condition after about 12 hours of operation, the circuit should be pumped down and the filter-drier changed; or verify system condition by performing an acid test on the compressor oil.

Preventive Maintenance Schedule

OPERATION	WEEKLY	MONTHLY (Note 1)	ANNUAL (Note 2)
General			
Complete unit log and review (Note 3)	X		
Visually inspect unit for loose or damaged components		X	
Inspect thermal insulation for integrity			X
Clean and paint as required			X
Electrical			
Check terminals for tightness, tighten as necessary			X
Clean control panel interior			X
Visually inspect components for signs of overheating		X	
Verify compressor heater operation		X	
Test and calibrate equipment protection and operating controls			X
Megger compressor motor *****			X
Refrigeration			
Leak test		X	
Check sight glasses for clear flow	X		
Check filter-drier pressure drop (see manual for spec)		X	
Perform compressor vibration test			X
Acid test oil sample			X
Condenser (air-cooled)			
Clean condenser coils (Note 4)			X
Check fan blades for tightness on shaft (Note 5)			X
Check fans for loose rivets and cracks			X
Check coil fins for damage			X

Notes:

1. Monthly operations include all weekly operations.
2. Annual (or spring start-up) operations includes all weekly and monthly operations.
3. Log readings can be taken daily for a higher level of unit observation.
4. Coil cleaning can be required more frequently in areas with a high level of airborne particles.
5. Be sure fan motors are electrically locked out.

*** Never Megger motors while they are in a vacuum.**

CAUTION

Service on this equipment is to be performed by qualified refrigeration personnel familiar with equipment operation, maintenance, correct servicing procedures, and the safety hazards inherent in this work. Causes for repeated tripping of equipment protection controls must be investigated and corrected.
Disconnect all power before doing any service inside the unit.
Anyone servicing this equipment shall comply with the requirements set forth by the EPA in regards to refrigerant reclamation and venting.

Filter-Driers

A replacement of the filter-drier is recommended any time excessive pressure drop is read across the filter-drier and/or when bubbles occur in the sight glass with normal subcooling. The maximum recommended pressure drop across the filter-drier is as follows:

Table 60, Filter-Drier Pressure Drop

PERCENT CIRCUIT LOADING (%)	MAXIMUM RECOMMENDED PRESSURE DROP ACROSS FILTER-DRIER PSIG (KPA)
100%	10 (69)
75%	8 (55.2)
50%	5 (34.5)
25%	4 (27.6)

The filter-drier should also be changed if the moisture indicating liquid line sight glass shows excess moisture in the system.

During the first few months of operation, filter-drier replacement can be necessary if the pressure drop across the filter-drier exceeds the values listed in the paragraph above. Any residual particles from the condenser tubing, compressor and miscellaneous components are swept by the refrigerant into the liquid line and are caught by the filter-drier.

Liquid Line Solenoid Valve

The liquid line solenoid valves that shut off refrigerant flow in the event of a power failure do not normally require any maintenance. The solenoids can, however, require replacement of the solenoid coil or of the entire valve assembly.

The solenoid coil can be checked to see that the stem is magnetized when energized by touching a screwdriver to the top of the stem. If there is no magnetization, either the coil is bad or there is no power to the coil.

The solenoid coil can be removed from the valve body without opening the refrigerant piping after pumpdown. Shut off and lock-out the unit power.

The coil can then be removed from the valve body by simply removing a nut or snap-ring located at the top of the coil. The coil can then be slipped off its mounting stud for replacement.

To replace the entire solenoid valve follow the steps involved when changing a filter-drier.

Remote Evaporator (AGZ-BM Only)

The evaporator is the direct expansion, shell-and-tube type with refrigerant flowing through the tubes and water flowing through the shell over the tubes. The tubes are internally finned to provide extended surface as well as turbulent flow of refrigeration through the tubes. Models AGZ 070BM or smaller have a stainless steel brazed-plate type evaporator. Other than cleaning and testing, no service work should be required on the evaporator.

Refrigerant Charging

Units are shipped with a holding charge of refrigerant and the system must be charged at the job site. Follow these recommendations when field charging. Refer to the unit operating charge found in the Physical Data Tables.

Unit charging can be done at any steady load condition (preferably at 75 to 100% load), and at any outdoor temperature (preferably higher than 70°F (21.1°C). Unit must be allowed to run 5 minutes or longer so that the condenser fan staging is stabilized at normal operating discharge pressure. For best results charge with two or more condenser fans operating on each refrigerant circuit.

The ACZ/AGZ units have a condenser coil design with approximately 15% of the coil tubes located in a subcooler section of the coil. This results in liquid cooling to within 5°F (3°C) of the outdoor air temperature when all condenser fans are operating. This is equal to about 15°F-20°F (8.3°C-11.1°C) subcooling below the saturated condensing temperature when the pressure is read at the liquid valve between the condenser coil and the liquid line filter-drier. Once the subcooler is filled, extra charge will not lower the liquid temperature and does not help system capacity or efficiency.

One of the following three scenarios will be experienced with an undercharged unit:

1. If the unit is slightly undercharged, the unit will show bubbles in the sight glass. Recharge the unit as described in the charging procedure below.
2. .If the unit is moderately undercharged, it will normally trip on freeze protection. Recharge the unit as described in the charging procedure below. However, freezestat trips can also be an indication of low flow or poor heat transfer in the system evaporator.
3. If the unit is severely undercharged, the unit will trip due to lack of liquid flow to the expansion valve. In this case, either remove the remaining charge by means of a proper reclamation system and recharge the unit with the proper amount of refrigerant as stamped on the unit nameplate, or add refrigerant through the suction valve on the compressor. If the unit is severely undercharged, the unit can nuisance trip during this charging procedure. If this happens, operate the unit at minimum load, adding charge until the sight glass is clear. Once the unit has enough charge so that it does not trip out, continue with step 2 of the charging procedure below.

Procedure to charge a moderately undercharged ACZ/AGZ unit:

1. If a unit is low on refrigerant, you must first determine the cause before attempting to recharge the unit. Locate and repair any refrigerant leak. Evidence of oil is a good indicator of leakage, however, oil can not be visible at all leaks. Liquid leak detector fluids work well to show bubbles at medium sized leaks, but electronic leak detectors can be needed to locate small leaks.
2. Add the charge to the system through the suction shutoff valve or through the Schrader fitting on the tube entering the evaporator between the compressor and the evaporator head.
3. The charge can be added at any load condition between 25-100% load per circuit but at least two fans should be operating per refrigerant circuit if possible. The suction superheat should be in the 8 to 12 degree F (4.4°C - 6.6°C) range.
4. Add sufficient charge to clear the liquid line sight glass and until all flashing stops in the sight glass.

5. Check the unit subcooling value by reading the liquid line pressure and temperature at the liquid line near the filter-drier. The subcooling values should be between 15 and 20 degrees F (8.3 and 11.1 degrees C).
6. With outdoor temperatures above 60°F (15.6°C) all condenser fans should be operating and the liquid line temperature should be within 5°F-10°F (2.8°C-5.6°C) of the outdoor air temperature. At 25-50% load the liquid line temperature should be within 5°F (2.8°C) of outdoor air temperature with all fans on. At 75-100% load the liquid line temperature should be within 10°F (5.6°C) of outdoor air temperature with all fans on.
7. Overcharging of refrigerant will raise the compressor discharge pressure due to filling of the condenser tubes with excess refrigerant.

Warranty Statement

Limited Warranty

Consult your local McQuay Representative for warranty details. Refer to Form 933-43285Y. To find your local McQuay Representative, go to www.mcquay.com.

ACZ/AGZ Troubleshooting Chart

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor Will Not Run	1. Main Switch. 2. Fuse Blown. Circuit breakers open 3. Thermal overloads tripped 4. Defective contactor or coil. 5. System Shutdown by equipment protection devices 6. No cooling required 7. Liquid line solenoid will not open 8. Motor electrical trouble 9. Loose wiring	1. Close Switch. 2. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset breakers after fault is corrected. Check for loose or corroded connections. 3. Overloads are auto-reset Check unit closely when unit comes back on line. Allow time for auto-reset. 4. Repair or replace 5. Determine type and cause of shutdown and correct it before resetting equipment protection switch 6. None. Wait until unit class for cooling 7. Repair or replace solenoid coil. Check wiring 8. Check motor for opens, shorts, or burnout 9. Check all wire junctions. Tighten all terminal screws
Compressor Noisy Or Vibrating	1. Low or no refrigerant charge 2. Compressor running in reverse 3. Improper piping support on suction or discharge 4. Worn compressor isolator bushing 5. Worn Compressor	1. Repair and recharge 2. Check unit and compressor for correct phasing 3. Relocate, add, or remove hangers 4. Replace 5. Replace
High Discharge Pressure	1. Noncondensables in system 2. System overcharged with refrigerant 3. Optional discharge shutoff valve partially closed 4. FanTrol wiring not correct 5. Fan not running 6. Dirty condenser coil 7. Air recirculation	1. Extract the noncondensables with approved procedures 2. Remove excess, check liquid subcooling 3. Open valve 4. Check FanTrol wiring 5. Check electrical circuit, Check fan motor 6. Clean coil 7. Correct
Low Discharge Pressure	1. Refrigerant flood back 2. Wind blowing into coil at low ambient 3. Faulty condenser temperature regulation 4. Insufficient refrigerant in system 5. Low suction pressure 6. Only one compressor operating	1. Correct 2. Shield coil from direct wind 3. Check condenser control operation 4. Check for leaks. Repair and add charge 5. See corrective steps for Low Suction Pressure 6. See corrective steps for Compressor Will Not Stage Up
High Suction Pressure	1. Excessive water temperature 2. Excessive load 3. Expansion valve overfeeding 4. Compressors running in reverse	1. Check control settings 2. Reduce load or add additional equipment 3. Check remote bulb. Regulate superheat 4. Check for proper phasing
Low Suction Pressure	1. Rapid load swings 2. Lack of refrigerant 3. Clogged liquid line filter-drier 4. Expansion valve malfunctioning 5. Condensing temperature to low 6. Compressor will not unload 7. Insufficient water flow 8. Evaporator head ring gasket slippage 9. Evaporator dirty 10. Rapid load swings	1. Stabilize load 2. Check for leaks, repair, add charge. Check liquid sight glass 3. Check pressure drop across filter-drier. Replace 4. Check and reset for proper superheat 5. Check means for regulating condenser temperature 6. See corrective steps for Compressor Staging Intervals Too Low 7. Adjust flow 8. Take pressure drop across vessel and contact factory to obtain design pressure drop for that vessel 9. Clean chemically 10. Stabilize load
Compressor Will Not Stage Up	1. Defective capacity control 2. Faulty thermostat stage or broken wire 3. Stages not set for application	1. Replace 2. Replace 3. Reset thermostat setting for application
Compressor Staging Intervals Too Short	1. Thermostat control band not set properly 2. Erratic water thermostat 3. Insufficient water flow 4. Rapid load swings	1. Set control band wider 2. Replace 3. Adjust flow 4. Stabilize load
Compressor Oil Level Too High Or Too Low	1. Oil hang-up in piping 2. Low oil level 3. Loose fitting on oil line 4. Level too high 5. Insufficient water flow - Level too high 6. Excessive liquid in crankcase - Level too high 7. Short cycling	1. Review refrigerant piping and correct 2. Check and add oil 3. Check and tighten system 4. Adjust thermal expansion valve 5. Adjust flow 6. Check crankcase heater. Reset expansion valve for higher superheat. Check liquid line solenoid valve operation. 7. Stabilize load or increase staging interval
Compressor Loses Oil	1. Lack of refrigerant 2. Excessive compression ring blow-by 3. Suction superheat too high 4. Crankcase heater burnout	1. Check for leaks and repair. Add refrigerant 2. Replace compressor 3. Adjust superheat 4. Replace crankcase heater
Motor Overload Relays Or Circuit Breakers Open	1. Low voltage during high load conditions 2. Defective or grounded wiring in motor 3. Loose power wiring or burnt contactors 4. High condenser temperature 5. Power line fault causing unbalanced voltage	1. Check supply voltage for excessive line drop 2. Replace compressor motor 3. Check all connections and tighten 4. See corrective steps for High Discharge Pressure 5. Check supply voltage. Notify power company. Do not start until fault is corrected.
Compressor Thermal Protection Switch Open	1. Operating beyond design conditions 2. Discharge valve partially shut 3. Blown compressor internal gasket 4. Voltage range or imbalance 5. High superheat 6. Compressor bearing failure	1. Add facilities so conditions are within allowable limits 2. Open valve 3. Replace gasket 4. Check and correct 5. Adjust to correct superheat 6. Replace compressor

Notes

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